THE ILLUMINATING ENGINEER

LIGHT
LAMPS
FITTINGS
AND
ILLUMINATION

THE JOURNAL OF GOOD LIGHTING

Official Organ of the Illuminating Engineering Society

FOUNDED IN LONDON 1908

Edited by
LEON GASTER

. OIL .
GAS
ELECTRICITY
ACETYLENE
PETROL-AIR
GAS
ETC.

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Special Features:

The Lighting of Shops and Show-Windows (Special Section)—Scientific Research in Illumination—Notes on the Convention of the Illuminating Engineering Society (U.S.A.)—The Candle-Power of Miners' Lamps—Lighting at the Agricultural Hall—Notes from Abroad, Correspondence, etc.

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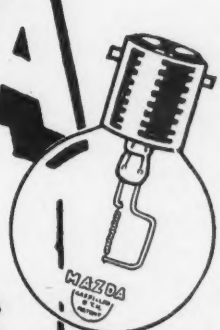

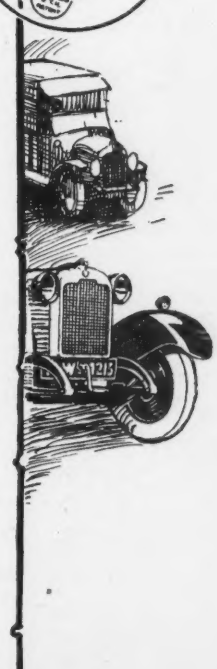

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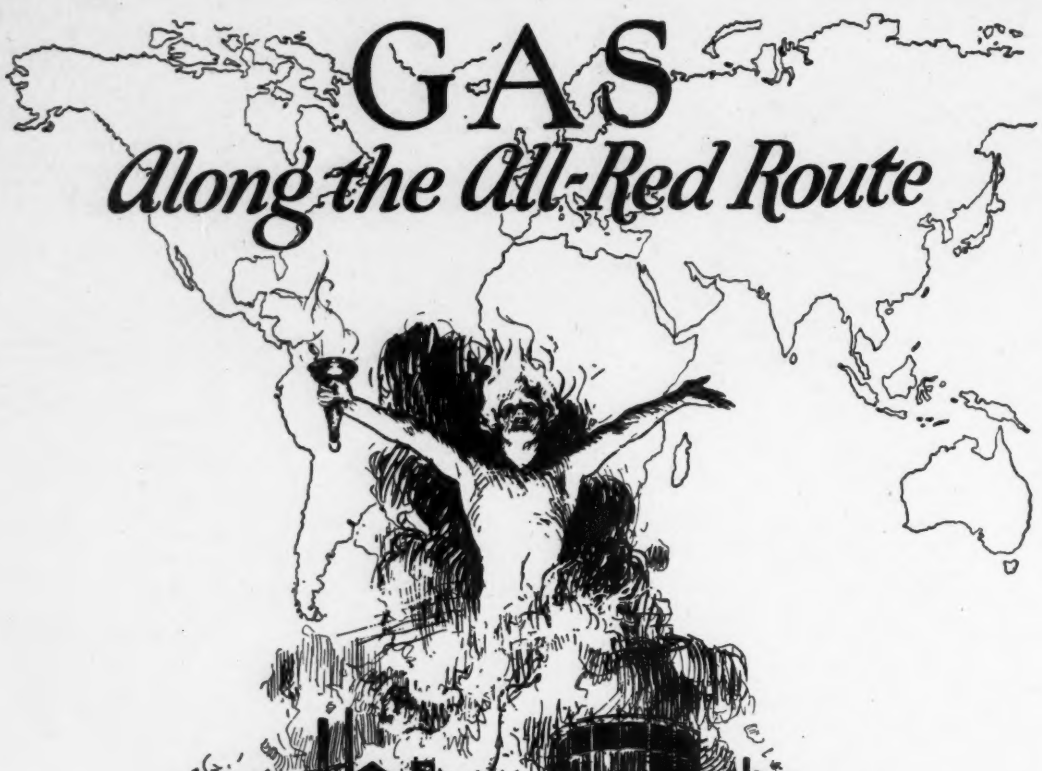

GAS - THE SPIRIT OF COAL
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All the world over civilised life needs light, heat and power—fuel for its industries and homes. The gas industry at Wembley occupies the largest space in the centre of the Palace of Industry, because it provides for these fundamental needs. The Gas Exhibit shows gas as the enemy of waste, whether of human energy or of material resources such as coal. It shows the reasons why gas is triumphantly extending its services to the Empire all along the All-Red Route, from Manchester to Melbourne and Vancouver to Bombay.

Women visiting the Exhibit see the gas industry placing comfort, health and leisure—escape from drudgery, fatigue and strain—even within the reach of poorer pockets. They see how gas provides for heating, cooking and water-heating an almost automatic service. They see, what is shown again in the Palace of Housing, the infinite attractions of an all-gas house—an Ideal Home at last made real.

Manufacturers find the gas industry offering the most reliable, controllable, clean and efficient fuel—the key to improving output in quality and in quantity both at once. For light, for power, and, above all, for heat, there is hardly a trade that is not served by gas the Empire over. The Engineering, Motor, Shipbuilding, Textile, Leather, Pottery, and indeed nearly all great industries are shown in the Exhibit to profit by the use of gaseous fuel.

Workers in industry can learn, what many know already, the immense improvements that are wrought in factory conditions by the elimination of the hot and heavy labour of handling solid fuel, of stoking and of clearing ashes. They see and appreciate the benefits of clean surroundings which everywhere attend the use of gas.

All men and women have brought home to them the fact that the extended use of gas, whether in industry or the home, means an abatement of the coal-smoke curse and the blessed admission of sunshine to their lives. They see the proof that gas has made possible at last the achievement of the ideal smokeless city.

All these and many other things are illustrated by "Living Tableaux," cookery demonstrations with Empire food products, moving machinery or daylight cinema in the British Empire Gas Exhibit, Wembley, 1925.

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See Page III of Cover

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The Lighting of Shop Windows

A CONSIDERABLE amount of effort is being expended this autumn on propaganda in favour of better methods of shop-window lighting—a subject that was dealt with statistically in a paper read before the Illuminating Engineering Society by Messrs. W. J. Jones and H. Lingard a few months ago. The main point revealed by this survey of lighting in retail shops was the fact that gasfilled lamps are still being used in many cases imperfectly shaded, or without shades at all. Of some 10,000 windows examined, approximately two-thirds exhibited this defect. The great majority of retail shops had adopted gasfilled lamps. But this only made their misuse more evident, for however bad the results of using unscreened vacuum lamps, the glare from the brighter filament of the gasfilled lamp is worse.

One is therefore glad to note the energetic campaign being carried out by the E.L.M.A. Lighting Service Bureau in London, now supplemented by the similar institutions established in Glasgow and Newcastle. On pp. 280-282 we give an illustrated account of the demonstrations now taking place, and we have also included in this number many illustrations of typical windows, showing how various problems in shop lighting have been met. We should like also to draw attention to the interesting contribution from Dr. Niethammer, of Prague, commenting on shop-lighting in that city. Evidently experience of window-lighting confirms that in this country. Some of the leading stores in London are now extremely well lighted and compare favourably with those in any city abroad. It is chiefly the retailers who have not yet grasped the desirability of adopting the motto "Light on the Object, not in the Eye," which the Illuminating Engineering Society has consistently advocated as the basis of good shop-lighting.

Amongst lighting experts this fundamental principle is generally accepted. We believe, also, that it is welcomed by display men, who can do a great deal to encourage scientific methods of window-lighting. But, owing to the multiplicity of lighting devices available, shop-lighting has become a more complex problem than in the past. So much depends not only on the design of the window, but on the art of dressing. "Display-windows" as we pointed out many years ago, can be much more successfully lighted than those which are crowded with a miscellaneous collection of objects brought close up to the glass. The aim of the modern salesman is to contrive a charming and attractive picture, not to endeavour to make the window a catalogue of contents of the shop. An entirely successful installation involves the co-operation of many experts, the architect who plans the façade, the window-dresser, and the lighting expert. This co-operation is especially necessary when coloured light is employed. The value of changing colour-schemes in attracting attention may be conceded. But real success lies in adapting the colour of the light to the nature of the goods. In some cases goods illuminated by red or green light, for example, might appear anything but attractive!

Judgment is again necessary when "artificial daylight" is used. It should be a principle for shops that deal in coloured goods to have a cabinet illuminated with a good form of artificial daylight, so that the appearance of dresses and other materials by natural and artificial light may be compared. Not only reasonable fidelity to ordinary daylight but sufficient intensity of illumination is here desirable. On the other hand one rather questions whether artificial daylight is desirable for general window and interior lighting; it is inevitably somewhat extravagant in consumption of energy, and the somewhat "cold" effect of the light might not prove so good as the mellower tone of ordinary artificial light from the salesman's standpoint.

A very great deal depends on the choice of reflectors. It is here that the skill of the lighting expert, in enabling windows of varying shape and size to be brightly illuminated with the smallest consumption, plays an important part. Every window really presents a distinct problem; the contents of the window and the nature of the background have also to be considered; "island windows," viewed from all sides, require specially careful treatment if exposure of light sources and troublesome reflections in window-glass are to be entirely eliminated.

All this leads to the conclusion that shop-lighting is a problem well deserving expert treatment. Its importance to the merchant is so great that his aim should be *first* to have the best lighting conditions, though naturally he wishes to use all his light to the best advantage and avoid waste. Experience shows, however, that the "drawing power" of a window depends very greatly on the manner in which it is illuminated—that a higher illumination may considerably increase the proportion of people who stop to look at a display, and that improved lighting in the shops lining a street has even had the effect of diverting people from adjacent ones. That "trade follows the light" is a true saying. Inside the shop the benefits of good lighting are equally evident, in promoting quicker service, preventing mistakes and enabling a great volume of trade to be done within a specified period in times of pressure.

Research in Illumination

THE Report of the Committee of the Privy Council for Scientific and Industrial Research for the past year (an abstract of which is given on p. 265), contains evidence of constantly expanding work. The estimate of expenditure for the present year is £380,263, which is somewhat greater than the amounts expended for the past two years, but should not be regarded as excessive in view of the magnitude of the task. In the past this country has doubtless been backward in the encouragement of industrial research. We are glad to think that the Department is doing a great deal to make up the leeway in this respect.

In these matters it is necessary to take broad views. Results from research are often apparently slow in coming, and it is only gradually that the benefits of much patient work are seen. But there is every reason to believe that the coming years will abundantly justify the work of the Department—and particularly its initiation of many researches of national value, which are beyond the unaided scope of individual persons and bodies.

A good example of this form of research is afforded by the work of the Illumination Research Committee. A sub-committee set up to investigate the nature of the illumination required for difficult factory processes is studying the lighting requirements of compositors, with the co-operation of the Industrial Council of the Printing and Allied Trades. The Architectural Committee will, it is hoped, report shortly on the question of daylight illumination in schools, factories, etc. Research is also being conducted on various problems submitted by H.M. Office of Works and on others suggested by the Home Office, Board of Education, Post Office and Ministry of Health. Certain other investigations are being conducted at the request of the Illumination Committee of the B.E.S.A. which is engaged in drafting specifications for types of lighting fittings, portable photometers, street lighting, etc. Arrangements have been made for exchange of information with the Committee of the National Research Council of America and similar co-operation with other bodies abroad will doubtless be organized. The programme of researches submitted is sufficient to occupy the Committee for a long time, and it is recommended that additional facilities should be provided at the National Physical Laboratory for further researches, covering requirements for at least the next five years.

The Report remarks that the Committee's activities are of direct interest to the community, both on general grounds and as users of light. As we have previously pointed out it is of the utmost importance that such researches should be conducted by an impartial and authoritative body, working in co-operation with others in a position to suggest enquiries and assist investigations. The Illumination Research Committee completely fulfils these requirements, being in touch with Government Departments, the Illuminating Engineering Society, the B.E.S.A. and research institutions abroad; and having, in the National Physical Laboratory, an admirable centre for the carrying out of experimental work. Eminent medical men and architects, besides lighting experts, act on this committee, which is thoroughly representative, and we may add that all members serve in an honorary capacity.

We venture to think that this organization for impartial research in illuminating engineering cannot be paralleled in any other country at the present time, and the Department deserves the gratitude both of the public and the lighting industry for the sympathetic and thorough manner in which it has taken up this work.

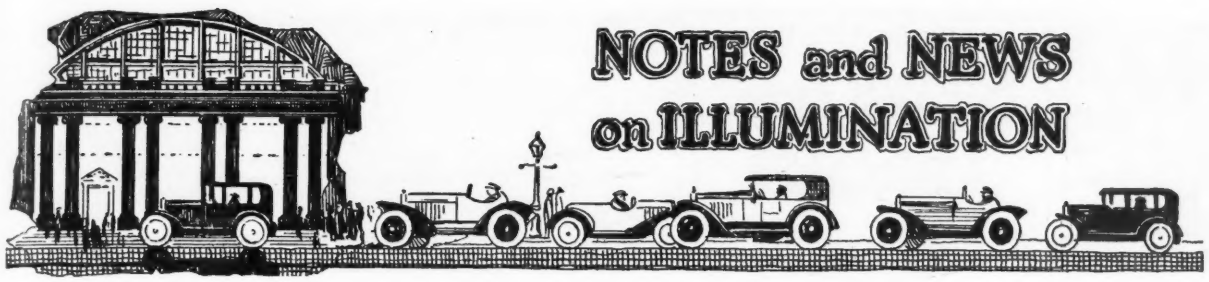
The First International Assembly of the Technical Press

THE First International Assembly of the Technical Press, held in Paris during Oct. 1st-4th, was a noteworthy event. Hitherto, as was pointed out in the programme of the Congress, there has been no organized effort to assemble representatives of technical papers in different countries. The exact form which this international organization should assume requires some consideration, and no doubt ultimately it should be allied to other journalistic international associations. But the technical press has problems of its own, and it is very desirable that there should be some central international body capable of looking after its interests.

A start towards the consideration of these problems was made at this first gathering when an International Federation of the Technical Press was established. The writer had the honour of being elected one of the first Vice-Presidents. Such matters as the status and objects of trade and technical papers, methods of transport and distribution, postal rates, and methods of make-up (paper, illustrations, etc.) were down for discussion. Another question was the formation of special technical, commercial and economic libraries—a matter being actively considered by the Association of Special Libraries in this country, which held an important conference at Oxford during September 25th-28th; on this occasion also the subject was dealt with from the international standpoint.

Yet another suggestion was that Esperanto should be adopted as a medium of intercourse between journalists of different nations. We hardly think that the time is ripe for the use of Esperanto or any other international language, as the medium in which technical journals of different countries should be printed. But there is a good deal to be said for its adoption as a spoken language between technical journalists, men of science and learned men generally. In the present day, when international relations are developing so rapidly there is a need for some common official language. Since one can hardly hope that English would be generally accepted for this purpose—much as we should desire it—it is possible that Esperanto, which is learned with ease, might answer the purpose.

The proceedings received the patronage of the French Government, M. Gaston Domergue, President of the French Republic, being the Honorary President. The gathering was opened by M. Yvon Delbos, in the name of the Government, whilst the banquet on October 3rd was presided over by M. Chaumet, Minister of Commerce, Industry and Posts and Telegraphs. On this occasion there was a very representative international gathering. It was pleasant to see delegates from practically all the chief countries, and the writer had opportunities of establishing relations which should be of great benefit to the Illuminating Engineering Movement, already international in scope. It is interesting to note, as an indication of the international lines on which this gathering of technical generalists is conceived, that the first three Vice-Presidents represent respectively Germany, Great Britain and Italy, whilst the first President (M. Mounier) is French. In this organization bodies representing the intellectual workers of France are also represented. We shall watch with interest the development of the Federation, which appears to be capable of good work, and meantime we should like to express our appreciation of the efforts of its indefatigable President (M. Mounier, and of the characteristic enterprise of our French confrères in initiating this movement, designed in the cause of international peace.



"Safety First" and Good Lighting

The current issue of *Safety First*, the brightly written organ of the National "Safety First" Association, contains a good deal of miscellaneous information on accidents. Rudyard Kipling has somewhere said that "Everything in life, from marriage to manslaughter, turns on the speed and cost at which men, things and thought can be shifted from one place to another." As a journal, we are concerned with shifting thought, and there is certainly room for effort in the dissemination of views on the need for good public lighting. *Safety First* emphasizes the need for better lighting of streets to secure greater safety for motorists and pedestrians. Driving by night involves a much greater strain than driving by day, and although the motorist can do a good deal to help himself by the choice of well-designed headlights, security depends mainly on the degree of perfection with which roads and streets are illuminated. According to a recent advertisement, 74 out of 101 death benefits paid by *The Daily Mail* during the first six months of this year might be described as traffic accidents. The largest proportion of claims were due to persons killed whilst motor cycling. But it is surprising to note that 24 per cent. were returned as "killed at home." This certainly shows the need for educational methods. Only two cases—of persons drowned while bathing and killed at football—can be described as out-of-the-way and exceptional accidents. It is quite likely that a considerable proportion of these fatalities could be traced to inadequate illumination, either in the streets or in the home.

A New Method of Illumination for Microscopes

In the *Transactions* of the Illuminating Engineering Society (U.S.A.) a new method of illuminating specimens viewed under the microscope is described. The method is based on the use of rods of fused quartz, which absorbs but little of the light, and, having a high melting point, can be brought very close to the source. The ends of the rod are ground uniformly, but not polished, and diffused light, free from images of filaments, etc., is thus obtained. Miss S. B. Leiter, metallographist in the research laboratory of the General Electric Company, has obtained very satisfactory results with these clear fused quartz illuminators. With the ordinary microscope a half-inch quartz rod with a right-angle bend is used, the light source being a small moving-picture type lamp. In the case of the inverted type of microscope, where illuminating a transparent specimen presents difficulties, the use of the quartz rods is especially convenient. Since intense heat does not shatter quartz, one end of the rod can be placed immediately over an arc, and an intense illumination thus obtained.

Institution of Public Lighting Engineers

The Council of the Institution of Public Lighting Engineers has elected Mr. L. Gaster, the Hon. Secretary of the Illuminating Engineering Society, an honorary member of the Institution. We record with pleasure this recognition of the common object of both bodies in regard to the promotion of better public appreciation of good public lighting, to which the Illuminating Engineering Society has devoted so much effort since its initiation in 1909.

Street Lighting Improvements in Edinburgh

We notice that, according to *Municipal Engineering*, Edinburgh, in common with other cities, has had experience of accidents due to motor-vehicles colliding with refuge-islands. Mr. R. Beveredge, the lighting superintendent, mentions that, owing to several accidents of this kind, special attention is now being given to the lighting. It is significant that these accidents occurred mainly at night-time, so that no doubt lighting is an influential factor. It is possible that this country might take a hint from the United States, where illuminated notice signs are frequently mounted, making such islands conspicuous objects. Experiments have also been made with pillars carrying luminous devices, mounted on a flexible base, which yield when collided with, and thus help to avoid accidents of a serious kind. Improvements are also being made in the general lighting of Edinburgh, the burners in lanterns being now placed above the reflector, so that mantles are brought somewhat closer to its surface. This is stated to have led to a material improvement of the roadway illumination. We are glad to note that it has been decided to form an Edinburgh Committee of the National "Safety First" Association. According to *Safety First*, Edinburgh is one of those cities where the number of street accidents is exceptionally large, so that every possible step—including the provision of good public lighting—should be taken for their prevention.

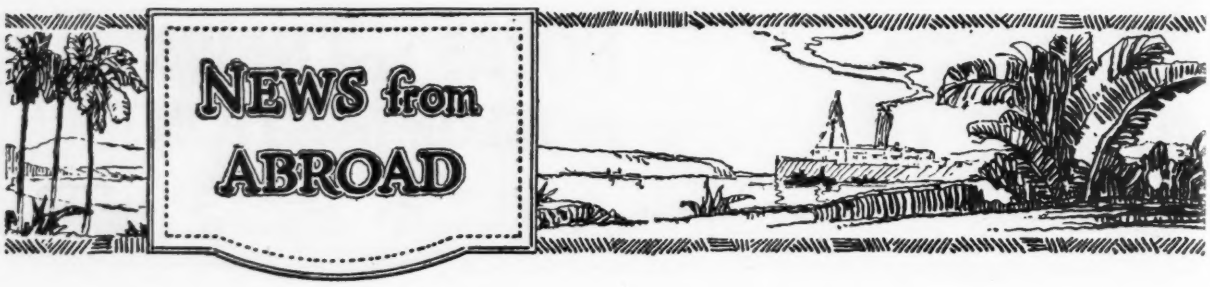
Artificial Sun-Baths for Artistes

World Power, in referring to the recent visit to Drury Lane Theatre arranged by the Illuminating Engineering Society, mentions that Sir Alfred Butt has added yet another example of the use of electric lighting—the equipment of an artificial sun-bath for the use of artistes. Dr. Saleeby, in our last issue, emphasized the value of such light-baths for night-workers, who do not get much opportunity of seeing the sun by day; and one imagines that artistes are apt to suffer in this respect.

Scientific Shop Lighting

A lecture on the above subject was recently given by Mr. H. S. Allpress at a meeting of the Harrogate Grocers' Association. Mr. Allpress emphasized the value of good lighting as a commercial asset. The public always tend to congregate in a brightly lighted street, and in leading London stores the "drawing power" of good illumination is fully recognized. The lecturer pointed out the futility of lighting by bare lamps, and explained how the use of scientific reflectors is one of the main essentials in good illumination; whilst recognizing the spectacular value of colour, he warned traders against the indiscriminate use of encircling coloured shades, which absorbed a great deal of light, and sometimes distorted the appearance of coloured objects in the window. The three chief points emphasized were : (1) The diffusion of light and avoidance of distorting shadow-effects, (2) the screening of filaments, and (3) the provision of sufficient illumination to display the contents of the window to advantage.

The lecture was illustrated by numerous lantern-slides, showing photographs of installations taken entirely by the artificial light provided.



Illuminating Engineering Abroad

In this number we are giving (page 266) a summary of some of the papers read at the Convention of the Illuminating Engineering Society last month. These covered a very varied set of topics, and it is only possible in the space available to give a general idea of their contents. One interesting point brought out is the number of problems that are being studied simultaneously in this country and abroad, and it is evident that in many cases investigations are leading to similar conclusions. We hope shortly to be able to give some account of the papers read at the annual meeting of the Illuminating Engineering Society in Germany. Illuminating engineering has now become an international subject, and it is of great importance that experts in each country should be kept informed of what is taking place elsewhere. This journal therefore hopes to play a useful part in collecting information from different countries.

Bracket Lights for Highway Lighting

In parts of the United States special problems in street lighting often arise, one of the most common being the illumination of streets lined by densely spaced trees, whose foliage is continually encroaching on the roadway. In many cases the obstruction of foliage is avoided by using a cross-arm or bracket attached to the side post and projecting some distance over the roadway; this is often effective even when the lower part of the post is immersed in bushes. In some other cases, avenues whose sides are particularly densely occupied by trees can be lighted by means of centrally suspended lamps mounted on wires spanning the road and attached to tree trunks. Mr. A. L. Spring, in a recent article in *The Electrical Review*, discussing some of these methods, also mentions the experience of the little town of Sierra Madre, which conceived the idea of directing as much traffic as possible into its business centre by the aid of light. By the installation of special lighting units on stretches of road passing into the centre of the city this aim was successfully realized.

The Need for Higher Working Illumination in Mines

In the September issue of this journal reference was made to the paper read by Dr. Bruns at the Fourth International Medical Congress on Industrial Accidents and Diseases, dealing with nystagmus amongst workers in the Ruhr mines. Like other authorities, Dr. Bruns considers that the disease is primarily due to inadequate illumination.

This leads to the consideration, discussed in this journal a few months ago, how the light yielded by existing lamps may be improved. There is much to be said for the view that miners would now accept a lamp with a larger battery and of necessarily higher weight, if thereby lamps of higher candle-power could be obtained. There is now a general recognition that *at least* one candle-power should be maintained, and it would be a distinct advantage if a considerably greater candle-power could be secured. Unfortunately it appears that very much less than one candle-power is obtained from many of the lamps in practice. The following figures, given by Mr. Ph. Schereschewsky in *The Revue de l'Industrie Minerale*, and commented upon in a recent issue of *The Colliery Guardian*, are instructive:—

DATA OBTAINED AT THE BRUAY CENTRAL STATION.

Lamp.	Volts.	Amps.	Watts.	C.P.	Watts/ Candle.
No. 1	2·2 ...	0·884 ...	1·95 ...	1·60 ...	1·21
	2·0 ...	0·844 ...	1·69 ...	1·07 ...	1·58
	1·8 ...	0·802 ...	1·44 ...	0·68 ...	2·00
	1·6 ...	0·757 ...	1·21 ...	0·4 ...	3·1
No. 2	2·2 ...	0·882 ...	1·95 ...	1·28 ...	1·52
	2·0 ...	0·843 ...	1·69 ...	0·85 ...	1·99
	1·8 ...	0·800 ...	1·44 ...	0·52 ...	2·77
	1·6 ...	0·755 ...	1·21 ...	0·29 ...	4·17

It will be observed that the lamps under the best conditions, i.e., at the beginning of the test, were only working at 1·21 and 1·52 watts per candle-power respectively; A drop in P.D. to 1·8 volts reduced the candle-power to 0·68 and 0·52 respectively. The importance of regular charging of all lamps at the end of each shift is evident, but it is probable that, with lamps run at the usual efficiency, a candle-power well below 1 will often be found. It is stated that the life expected for the bulbs is about 1,000 hours, and it is evident, in the case of miniature lamps, that such a life can only be obtained at a very considerable sacrifice of efficiency. It may be mentioned that these particular lamps were made by a firm of the highest international reputation, so that it was presumably not the quality of the lamps that was at fault.

The point may therefore be raised whether mining companies are not exercising false economy in aiming at a life of 1,000 hours. It would probably pay them well to be content with half of this life if thereby a substantially higher efficiency can be obtained. There are good reasons for thinking that a bulb operating at not less than 1 candle-power per watt would be a much more economical proposition, seeing that the cost of the bulb itself is a very small item in the running expenditure. In the article referred to it is put at 0·01 francs—say 1-30th of a penny—per lamp per shift, and thus forms a microscopic proportion of the cost of labour.

The above figures also show the advantage of using a cell of large capacity, even if the weight carried by the miner is thus increased. Four-volt batteries are now coming into use, and it is possible that this will ultimately lead to the use of gasfilled lamps, which would increase the candle-power furnished by the miners' lamp very materially.

Obituary

DR. HANS BUNTE.
Born December 25th, 1848. Died August 17th, 1925.

WE learn with regret of the death of Dr. Hans Bunte, who for long had been a leading figure in the gas industry in Germany. He was early associated with Herr Schilling, director of the Munich Gas Company, and subsequently co-operated with him in the production of Schilling's *Journal für Gasbeleuchtung*, of which he ultimately assumed sole charge, when in 1884 he became general secretary of the Deutscher Verein von Gas und Wasserfachmännern. Much of his early work was concerned with problems in gas production, calorimetry, etc., but later, as Professor at the Karlsruhe Technische Hochschule, he took a keen interest in the design of the incandescent burner. He was a keen advocate of education and was associated with the foundation of the Gas Research Institute in 1906, and he took an active part in the formation of the German Illuminating Engineering Society.

TECHNICAL SECTION

COMPRISING

Transactions of The Illuminating Engineering Society and Special Articles

The Illuminating Engineering Society is not, as a body, responsible for the opinions expressed by individual authors or speakers.

The Report of the Committee of the Privy Council for Scientific and Industrial Research

THE above Report for the year 1924-5 bears evidence of the continually expanding work of the Department. £380,263 was expended, as compared with £328,281 for 1924-5 and £276,863 for 1923-4. But there can be no question that money expended on the application of science to industry is well spent. In this connection the remarks of the Prime Minister, in a recent speech in the House of Commons, are quoted. The application of science to industry is a long business at best, expensive both in money and brains. But it is justified in the long run.

A Visit to the United States.

A deputation of two members of the Advisory Council visited the United States of America during the last year in order to study on the spot developments in research. This exchange of views should have useful results. During the year 258 grants, totalling £35,000, were made to individual experimenters. Some assistance has also been given towards the cost of publishing scientific papers, a grant of £1,500 being allotted to the Royal Society for this purpose. *The Journal of Scientific Instruments* has been carried on successfully during the past year, and the Institute of Physics has now assumed entire responsibility for this publication.

Research on Illumination.

Of special interest to our readers is the account of the work of the Illumination Research Committee:—

Considerable progress has been made with the work of the Committee which is investigating problems of illumination. The examination of the particular conditions affecting compositors' work by the sub-committee set up to investigate the nature of the illumination required for the difficult factory processes, is being continued on a laboratory scale at Messrs. Kelly's offices at Kingston by the courtesy of that firm. The co-operation of the Joint Industrial Council of the Printing and Allied Trades continues to be given in the fullest measure. The Architectural Committee is continuing its investigations into the question of daylight lighting in buildings such as schools and factories; it is hoped that a report will shortly be published upon the research which has been carried on into the best methods of lighting of picture galleries.

Research is in hand upon certain problems submitted for consideration by H.M. Office of Works, including the permissible daylight factor for office work and the method by which this factor is to be estimated; while problems submitted by the Home Office, Board of Education, Post Office and Ministry of Health are being taken in hand as and when permitted by the Committee's programme of research.

Standardization.

The Committee is also undertaking investigations for the Illumination Committee of the British Engineering Standards Association, which is engaged in drafting specifications for types of lighting fittings, street lighting, etc., on certain matters upon which existing data are not sufficient.

A series of special reports on the results of investigations undertaken upon various problems of illumination will be issued by the Committee, and it is hoped that the first two reports, viz., a general introductory report, and a report on the transmission of light through various types of window glass, will be published at an early date.

Arrangements have been made for exchange of information with the Committee which has been formed under the Division of Engineering of the National Research Council of America to undertake research on illumination.

In a later section of the Report fuller details of this work are given:—

"Progress has been made in the various items of the preliminary programme of research on illumination, to which reference was made in our last year's report, and it is hoped that the results obtained in the course of certain investigations will shortly be published as special reports on the work of the Committee. Further investigations have, however, been undertaken, including researches for the Office of Works for the benefit of Government Departments generally, and certain work for the Illumination Committee of the British Engineering Standards Association. In view of the magnitude of the problems which are now receiving attention, and of others which will undoubtedly call for investigation as the science of illumination develops, we have considered what provision should be made for the acceleration of the progress of the work. In considering this question we have borne in mind that the Committee's investigations are of direct interest to the community, both upon general grounds and as users of artificial light. Moreover, the work of the Committee represents the only attempt which has so far been made in this country to undertake a comprehensive study of the problems of illumination, the success of which is bound to be seriously affected if facilities for investigation are restricted.

"In these circumstances we have recommended that additional facilities should be provided at the National Physical Laboratory to enable a comprehensive programme of work to be prepared, covering the requirements of at least the next five years."

Notes on the Proceedings of the Nineteenth Annual Convention of the Illuminating Engineering Society (U.S.A.)

IN our last issue we gave a list of the series of papers read at the above Convention, which opened on September 15th at Detroit, under the presidency of Mr. M. Luckiesh. We have now had an opportunity of examining this series of papers, and propose to give a summary of some of the chief problems discussed.

As usual, the reports and papers covered a wide ground. The Report on Progress for the past year is a very comprehensive one, and we are reserving this for special comment in a future issue. There were, however, some other reports submitted.

Motor Headlights.

Thus the Report of the Committee on Motor Vehicle Lighting remarks that this problem is attracting more attention than ever before. It is stated that the I.E.S. system has been so widely adopted that it may be called a "standard" system. It is, however, considered that present regulations should be more rigidly enforced, and it is further recommended that a special study of proper road illumination should be undertaken with a view to possible improvements in the regulations. It is, in fact, now clearly recognized that the problems of the lighting of roads and automobile headlights must be considered together. Some attention is given to a suggestion that satisfactory headlight conditions might be obtained by permitting the use of frosted lamps in plain parabolic reflectors. But collected experience seems to show that this method does not give satisfactory results for high-speed driving.

Another problem is the "dimming" of beams when approaching another vehicle. Opinion on this point, both in England and abroad, has been much divided. Hitherto American practice has favoured a fixed system of headlighting, but lately controllable systems have come into use. It appears, however, that "dimming" in the sense of diminishing the light, or even switching off the headlights entirely, has drawbacks; it may make things easier for an oncoming car, but the driver who thus diminishes his beam is unfavourably affected. On the other hand, the Committee is favourably inclined to the system of "depressible beams," i.e., a headlight which may be slightly tilted downwards for the period when an oncoming car is being passed. The most desirable angle of deflection is considered to be $2\frac{1}{2}$ to 3 degrees of arc. This idea is in conformity with the legal system in France; it is remarked that the tendency in England is also towards the adoption of some form of double system.

In conclusion, attention is drawn to the need for correlation of headlights with street lighting. On adequately lighted streets the need for headlights is very much reduced, and in some cities (e.g., in New York) the use of powerful headlights is forbidden on all streets. Yet there are many streets in New York where this regulation embarrasses the motorist. The Committee is accordingly seeking to define more exactly the conditions of street lighting which enable headlights to be dispensed with. Two papers, by A. W. Devine and R. N. Falge, also survey progress in the design of motor-car headlights, the latter also discussing the applications of the American standard system.

Traffic Control and Street Lighting.

"Traffic Control and Traffic Problems," by C. A. B. Halvorsen and J. R. Regan, is a very topical subject. The author points out that finger-posts at cross-roads, whilst serving a useful purpose by day, are not visible by night, and occasion frequent slowing up of drivers and distract their attention. Hence, in the United States the highway-flasher or beacon is beginning to take their place. In American methods of guiding city traffic signal codes play a prominent part, and the use of luminous indicators showing the direction in which traffic should proceed are becoming more and more used. Many of these devices are illustrated, and a detailed description is given of the method of operation in New York, Boston, and other cities. An important element in the success of any such system is universal acceptance of principles by both pedestrian and driver. Hence the necessity for standardization of methods.

In connection with the above paper a "symposium" on "Residence Street Lighting" may be noted. This contains the series of twelve solutions of a problem in street lighting for which a typical residence street in a city of over 100,000 population was selected.

A paper by Messrs. O. R. Hogue, C. Howard and E. D. Tillson, describing some experiments in Chicago on the "Artificial Lighting of Show-windows during Daylight Hours" is dealt with separately on page 267.

Daylight Illumination.

The next item to be noted was a series of three papers dealing with daylight illumination. Mr. W. C. Randall, who discusses sawtooth design, remarks that its main object is to avoid the admission of direct sunlight. The problem is to ascertain the greatest slope that can be adopted subject to this condition, and, generally speaking, more information in regard to the effect of shape and size of windows, inside reflecting surfaces and quality of glass is needed. Mr. H. H. Higbie and Mr. A. Levin deal with the prediction of daylight from sloping windows, for which various mathematical formulæ are derived, and Mr. W. S. Brown discusses similar calculations for vertical windows.

The Influence of Illumination on Production.

Professor P. W. Cobb, in describing a series of tests on the relation between illumination and speed and precision of effort, points out that this is only one aspect of a very broad problem. Apart from the immediate effect of good lighting on the work done, the best management cannot afford to neglect such matters as safety in all places, freedom from eyestrain and glare, and the health and comfort and general well-being of the producers. The problem is mainly one of physiology of vision, and experiments in the laboratory have a useful bearing on industrial operations. The speed with which reading can be done is one process that perhaps comes nearest to tests in practice. In such tests there is one important point to be noted—the greatest improvement is to be expected in situations where the absolute visibility of the object approaches its lower limit.

This is strikingly brought out by the familiar curves connecting speed of reading and illumination. When reading was done with old English type on a white background the curve bends very sharply up to about 12 foot-candles, after which the improvement is slow. But when the same letters on a background having only a 23 per cent. reflection factor are read, the curve was still mounting swiftly at 25 foot-candles. A similar effect is noted when, instead of a relatively large object, we substitute a small one difficult to see. *Contrast* between an object and its background plays a great part. By making an improvement in this direction an advance in efficiency of work may often be more easily (and much more economically) produced than by increasing the illumination! In other words, an essential element in illuminating engineering is "making an object easier to see."

Industrial Lighting.

Following this contribution, we may note at the same time papers dealing with "Illumination of Factories" and "Automobile Plant Lighting." The former gives a good account of the methods adopted in improving the lighting of the factories and general offices of the General Electric Co. (U.S.A.). This is fully illustrated, and describes the investigations of the Works Illumination Advisory Committee. The second paper is

interesting in showing the very special lighting conditions required in a motor-car factory, one of these being the need for illuminating both the exterior and interior of enclosed bodies mounted on moving conveyors.

Moore Gaseous Conductor Lamps.

We now come to a series of miscellaneous papers, which deal with interesting problems, but can only be very briefly surveyed on this occasion.

"Recent Developments of Moore Gaseous Conductor Lamps" is dealt with in two portions, by Mr. D. Macfarlan Moore and Mr. L. C. Porter respectively. The former describes the latest forms of lamps, capable of glowing when mounted direct on an ordinary lighting circuit, and the latter describes some of their chief applications. Besides the familiar use of the lamps for night lights, pilot lights, etc., they are also being widely used by the Army and Navy for lighting various instruments, gun-scales, etc.; it is also suggested that, owing to their low consumption, they might be used, with portable batteries, for warning signs to motorists on lonely roads where no gas or electric supply is available. One of the most interesting possible applications, however, is for the transmission of pictures by wireless ("radio-vision"). For this purpose the main requirement is that the lamp should extinguish and light up practically instantaneously; and this, it is claimed, the gaseous lamps can do.

Mr. R. J. Piersol describes some experiments with chromium-plated reflectors for motor headlights, flood-lighting units, etc. These surfaces will take a high polish, and being of extreme hardness are not at all easily scratched. They are also non-corrosive, and therefore appear to have promising possibilities in the lighting field.

Effect of Coloured Light.

Mr. M. Luckiesh and Mr. A. H. Taylor summarize the results of tests on 23 different-coloured ribbons designed to compare the fading action of natural and artificial light. The conclusion is reached that approximately equal degrees of fading will result from exposures to tungsten filament radiation for 100 foot-candle-hours, skylight for 34 foot-candle-hours, or to sunlight and skylight combined for 77 foot-candle-hours. Experiments recorded by Mr. C. E. Ferree and Mr. G. Rand seem to lend support to the view that from the standpoint of vision a mixture of natural and artificial light is not desirable. The same point is partially dealt with in a paper by Mr. F. C. Carlson, who discusses the effect of daylight and light from tungsten and mercury-vapour lamps, and their mixtures, in metal-work. Results appear to depend considerably on the nature of the surface viewed. Thus daylight seems preferable for zinc plates. In this case mixtures of lights seem somewhat undesirable, but the results were inconclusive for copper plates.

Photometry.

Finally, there are three papers on photometric subjects. Dr. C. H. Sharp and Mr. Carl Kinsley describe some experimental work on a photo-electric photometer, a novelty being the use of a triode thermionic tube to amplify the feeble effect in the photo-electric cell. The arrangement has given promising results, although certain difficulties in connection with the elimination of extraneous effects have still to be overcome.

Mr. S. H. G. Hibben describes a variety of methods of illustrating distribution of light from illuminants, polar curves, etc. Thus, complete solid objects showing the contour of polar curves in space have been constructed. Solid models to demonstrate the distribution of light from asymmetric units are also illustrated. Other models in plaster of paris are designed to reveal distribution of illumination over a horizontal surface. The latter should be very useful to lecturers. Another device is to superimpose, over a photograph of a lighting installation, a ruled diagram showing the distribution of illumination. Mr. F. Benford contributes a further exposition of his "Isocandle" system of plotting photometric data, a departure which has already been noted in these columns.

Lighting of Show-Windows during Daylight Hours*

An interesting paper by Messrs. O. R. Hogue, C. Howard and E. D. Tillson refers to some experiments made by the Commonwealth Edison Co., of Chicago, which has set apart a special window for trying out methods of illumination during daylight hours. In order that a window may "stand out" during the daytime, and effects of reflections of surrounding objects in the glass may be inappreciable, an exceptionally high artificial illumination is needed. But it is thought that under special conditions, artificial illumination, even during daylight hours, might prove a practical scheme.

The Company invited leading retailers to exhibit goods in this window during periods of two weeks each, the Company providing the special illumination. The window was originally provided with one row of ceiling outlets containing 100-watt lamps on 12 in. centres. This ceiling-illumination was doubled at the start, and arrangements were made for the use of ten 400-watt "spot" lights of special design. It is quite a common sight in Chicago to see a 200-watt spot-light fastened to a transom bar and trained on a stand of merchandise, being kept burning during daylight hours. Such a unit, at a distance of two feet, produces 6,400 foot-candles. At four feet this is reduced to 1,000 foot-candles, and at 10 feet only 48 foot-candles. Hence, in order to produce an illumination which would be really effective in daylight the spot-light should not be further away from the goods than four feet. (Of course, if colour screens are used even this distance would be ineffective.) It was therefore thought necessary to devise units that could be brought very near to the goods without light straying out sideways. For this purpose a special unit equipped with "spill-shields" was designed. This eliminates the view of the filament, which would otherwise be visible through a wide angle. With the aid of these units an illumination that rendered objects "positively incandescent" in appearance was produced. In some cases colour screens were also used, a flasher furnishing colours from opposite ends of the spectrum in succession.

Observations were made of the number of people who stopped to look at these windows. Thus, in the case of the first display (millinery) there were, on the average, 34 people between 10 and 10-45 a.m.; 70 people between 12 and 12-45; 41 people between 4 and 4-45 p.m.; and 18 people between 8 and 8-45 p.m. Various pictorial effects were produced. One of these was a woodland scene, an imitation of mellow sunlight by means of amber spots. Some artistic effects were, however, not sufficiently intense to compete with daylight, and had to be abandoned. In every case some attempt at motion was contrived.

One of the most striking effects seems to have been a series of fans, including a mammoth one, in rotation —an exhibit which attracted much attention, because the weather in Chicago was particularly hot and oppressive at that time! These fans were shown by means of a silhouette effect, i.e., appearing black against a light orange background, behind which 1,000 watts in spot-lights with orange-coloured shields were concentrated.

These experiments were useful in showing how ingenuity can contrive luminous effects which are striking, even in full daylight. Such windows will stop as many as 6,000 people a day, and naturally impressed merchants with the possibilities of bright lighting as an advertising device. Although there were cards in every window explaining the object of the display, yet the Electric Shop employees were obliged to redirect many people who entered the store believing that the Edison Company had gone into the millinery business, or what not! As a result of the display, many local merchants have been interested, and have begun to experiment under the Company's advice.

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* Abstract of a paper read at the 19th Annual Convention of the Illuminating Engineering Society (U.S.A.).

Fundamental Principles of Industrial Lighting*

By Professor Dr. HOLTZMANN (Karlsruhe)

IT is desirable, both from the hygienic and economic standpoints, that more attention should be devoted to factory lighting. In many cases regulations in Germany only specify in general terms that there should be "sufficient light." In practice clear and definite conceptions of what is meant by good lighting are needed. Portable instruments for measuring illumination are now available, and should be in the hands of all building and illuminating experts, as well as inspectors of factories. In Germany the Bechstein instrument is a simple and accurate type; more recently a cheaper and practical form of illumination-photometer has been introduced by the Osram-Gesellschaft.

Good illumination involves sufficient illumination, freedom from glare and inconvenient shadows, and sufficiently uniform illumination. The measurement is commonly made in an horizontal plane one metre above the floor, but the most important place to study is the surface on which work is actually done.

In speaking of factory lighting, we are apt to think first of the artificial illumination. Nevertheless, the conditions of natural lighting are also of extreme importance. Natural lighting varies immensely, e.g., between limits of 100 and 60,000 lux. Lighting from overhead skylights is in general more effective than light derived from windows. Illumination thus produced may be very uniform and free from troublesome shadows, but the glass must have smooth surfaces, so that dirt is not readily collected. Windows should be carried right up to the ceiling, so as to admit the maximum of light coming from a high angle; window surface should not be less than 12-13 per cent. of the floor area. Daylight being itself so variable, the most important quantity, denoting access of daylight, is the "daylight factor" (i.e., the ratio between the illumination inside a room to the unrestricted illumination outside). This factor ought not to fall below 1-2 per cent., though in many workrooms it does so. A combination of overhead and window illumination is much to be preferred, and in these circumstances the daylight factor may be considerably higher than the value mentioned. In multi-story buildings it is a great advantage for rooms to receive light from both sides. The daylight factor is also favourably influenced by the use of light-coloured materials for walls and ceiling. From the standpoint of lighting, a north sky aspect is often preferred; otherwise light-coloured blinds are desirable to screen direct rays of the sun. On the other hand, from the purely hygienic aspect, the benefit of the entrance of direct sunlight, with its effect on the skin, blood and bodies of workers, should not be overlooked.

The degree of illumination desirable for different processes varies from 25 to 250 lux, but the influence of the colour of material must be considered. Workers on black material may require 15 per cent. as much illumination as would suffice for work on white cloth. "Glare" may be of the direct variety—i.e., the result of exposed bright source in the range of vision. This can be obviated by the various light-diffusing materials used for modern globes and reflectors. But glare may also be of an "indirect" character, caused by reflection from highly polished material. This form of glare can be eliminated partly by proper screening of the lamps (thereby reducing their brilliancy) and by the careful location of the sources of light. Glare, however, is not a function only of the actual brightness of light-sources, but is largely a matter of contrast. Thus the eye is vastly more sensitive to an incandescent filament by night than by day. Troublesome shadows are in general caused by uni-directional lighting, and may be largely eliminated by making use of diffusion, e.g., reflection of light from walls and ceiling.

Dealing next with methods of arranging lamps, Prof. Holtzmann pointed out that the inverse square law is apt to be misinterpreted. People are inclined to assume that the higher lamps are placed the lower is the illumination provided, and that much light is thereby lost. But in the case of a large number of lights, and especially when indirect and semi-indirect methods are used, the actual illumination is not diminished in inverse proportion to the height of suspension. Further, high mounting is conducive both to freedom from glare and greater uniformity. Inequality in illumination is much more marked when local lighting is used. In most cases, therefore, general lighting—if necessary in combination with local units, should be aimed at.

Prof. Holtzmann also pointed out the part played by the pupil-aperture and retina of the eye in adapting themselves to varying illumination. After 40 minutes' rest in complete darkness the sensitiveness of the retina may be increased as much as 8,000 times. Hence abrupt contrasts in brightness, or in illumination provided, and flickering of lights must be avoided; the constant effort of the eye to adapt itself to these varying conditions causes fatigue. Attention was drawn to the importance of maintaining clean walls and ceilings in the case of semi-indirect installations, and to the necessity of regular maintenance. Neglect of lamps and fittings, ceilings, etc., may result in 40-50 per cent. loss of light.

In conclusion, the lecturer pointed out the fundamental part played by reflectors in industrial lighting. Success depends in a large measure on the efficient direction and distribution of light. Transparent glass shades are useless. Reflectors of a contour such that light is directed mainly sideways and above the horizontal are of little value in factories. A type which concentrates most of the light downwards, the actual filament being concealed from view, is much to be preferred. Much attention has been devoted to designs of reflectors, and the comparative merits of polished mirror surfaces and diffusing materials have been discussed. The efficiency of the former may possibly be 20 per cent. higher than that of reflectors of a more diffusing character, but they are not so well adapted for general lighting.

In conclusion, it was remarked that in the planning of the modern factory one should not attempt to rely on rule-of-thumb methods, such as, for example, the allowance of 5 to 15 candle-power per square metre of floor-space. It is much better to decide the illumination that is desirable, and then to plan out the distribution of the lighting units so as to obtain this illumination in the most efficient manner.

* Abstract of a paper presented at the Fourth International Congress on Industrial Accidents and Diseases (Amsterdam, September 7th-12th, 1925).

POPULAR & TRADE SECTION

COMPRISING

Installation Topics—Hygiene and Safety—Data for Contractors—Hints to Consumers

(The matter in this section does not form part of the official Transactions of the Illuminating Engineering Society; and is based on outside contributions.)

Some Notes on Electric Lamps

No. 9

LIGHT AT THE MINIMUM COST

By W. J. JONES, B.Sc., A.M.I.E.E.

(E.L.M.A. Lighting Service Bureau).

IT has been known almost since the inception of the electric lamp industry that when a lamp has been burning a certain time that it pays to renew the lamp. Particularly was this the case with the old carbon lamp, which blackened so rapidly towards the end of its life. Modern lamps do not suffer from this disadvantage of blackening to anything like the same extent, since great care is taken to prevent undue sublimation of the filament. It is a well-known fact that the temperature of a filament determines its length of life; the higher the temperature the shorter the life, the lower the temperature the longer the life, and many engineers have accordingly endeavoured to obtain abnormally long lives from their electric lamps by under-running the filament. The usual method of doing this is by operating the lamp on a voltage lower than that for which it is marked. The amount of current passing through the filament is reduced, and at the same time its temperature of operation is lowered.

Engineers, however, are not familiar with the fact that this procedure does not necessarily give them light at the cheapest rate, for there are other factors involved of much greater importance than the life of the lamp itself. The cost of producing light depends upon a number of considerations, which may be enumerated as follows:—

1. The prime cost of the electric lamp itself.
2. The cost of electrical energy consumed throughout its life.
3. Indeterminate factors, such as the cost of cleaning, labour charges for renewal, etc.

These last charges can generally be neglected, but it is important to remember that the cost of electrical energy throughout the life of the average electric lamp is approximately ten times that of its prime cost, and is, therefore, by far the largest factor involved in computing the cost of lighting. It is for this reason that the efficiency of the lamp should receive prime consideration. Now high efficiency and extreme length of life are incompatible, for the higher the efficiency of the electric lamp of a given size and of a given type the shorter its life. In order to make this matter a little more clear Fig. 1 shows a series of curves which have been plotted giving the total cost of producing light, taking into consideration the lamp renewal cost and also the energy cost.

Considering in the first place the lamp renewal cost curve, it will be noticed that the higher the efficiency at which the lamp is run (low values of watts per candle) the greater the lamp renewal cost, for more lamps would be required in a given time because of their shorter life. On the other hand, when the lamp is operated at a low efficiency the renewal cost of the lamp is extremely small. The energy cost involved for producing light depends entirely upon the cost of electrical energy and the time during which light is obtained, and can, therefore, be represented by the straight lines shown on the graph. The total cost of producing light is obtained by the summation of the two curves; namely, lamp renewal cost curve and energy cost curve, and these total costs are shown for different costs of electrical energy per Board of Trade unit. It will be noticed that there is a definite minimum to any one of these curves, indicating that for a given type of lamp there is a definite operating efficiency that will give optimum results. On either side of this efficiency the total cost of providing light is greater, and it is found that light is obtained at the lowest cost when the average life of the lamp is of the order of 1,000 hours, and it is for this reason that this figure was adopted by the British Engineering Standards Association in consultation with many representatives of lamp consumers.

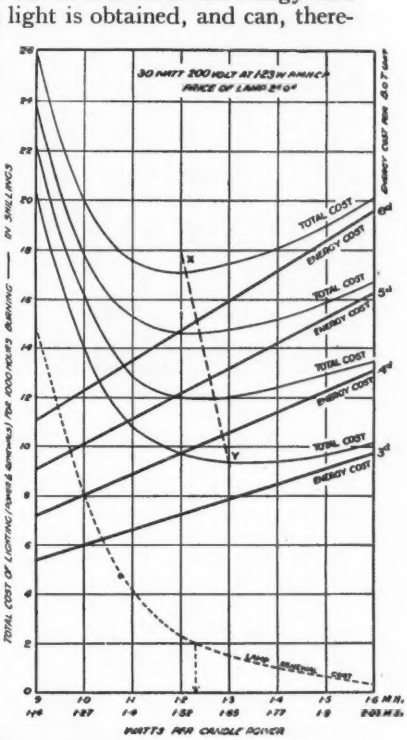


FIG. 1.—Showing Total Cost of Light.

Another interesting matter is worthy of consideration. It will be seen that as the cost of energy increases, so one can afford to operate the lamp more efficiently. This is entirely due to the fact that the cost of electrical energy is of proportionately greater importance when electrical energy is dearer. It will, therefore, be seen that the manufacturer of electric lamps in fixing the voltage at which a lamp should be operated has definitely taken into consideration the question of giving light at the cheapest cost, and it is obvious that any departure from the rated voltage of the electric lamp, under ordinary circumstances, will increase the cost of providing light. The habit, therefore, of placing a 110-volt lamp on a 100-volt circuit is greatly to be deprecated, and it is a good rule to ensure that lamps be operated on the circuits for which they are marked.

The Lighting of the Agricultural Hall

THE accompanying illustrations, showing the new lighting of the Agricultural Hall, which we have received from the Engineering and Lighting Equipment Co. Ltd. (St. Albans), give a good idea of the effect of the lighting units supplied by this firm—though we understand that the atmosphere was decidedly smoky at the time the photograph was taken. The feature is the provision of overhead units, flooding the hall with light and enabling all stalls and signs to be clearly seen, even those in narrow gangways. The fittings used were of the "Trent" pattern, utilizing prismatic band refractors, but the gasfilled lamps were sprayed one-third of the way up so as to eliminate any glare that might arise from the low position of the filament in the refractors. The fittings are mounted 30-36 ft. high, which is well above the eye-level of people on the floor; but the spraying of the lamps was thought desirable in order to remove any glare liable to be experienced by

Photo., Campbell Gray.

FIG. 1.—Showing Appearance of Agricultural Hall with New Lighting Installation.

persons in the gallery. The fitting (which is illustrated in Fig. 2) is equipped with a Goliath porcelain holder carried by one of the firm's anti-vibration discs—lighting fittings in an exhibition being often subject to considerable vibration when heavy machinery is working. A special feature is the use of phosphor-bronze toggles to facilitate easy lowering of the case—an improvement on the usual method of fixing the case with three screws.

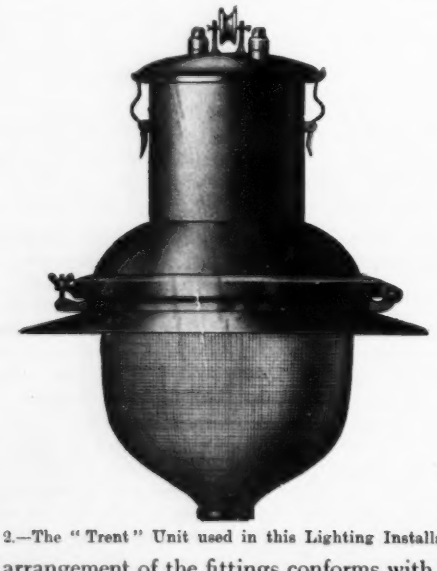


FIG. 2.—The "Trent" Unit used in this Lighting Installation.

The arrangement of the fittings conforms with the arc of the roof, and has a pleasing effect, particularly to people in the gallery; if lamps had been arranged on one level the effect, to them, would have been of one "sea of light." The area illuminated measures 312 ft. by 125 ft., which was originally lighted by 35 10-amp. flame arcs. With the conditions of spacing formerly used, gangways were apt to be in shadow, and faciæ were alternately dark and brightly lighted, according to their proximity to the arcs. The new lighting scheme consists of six rows of 13 lamps, spaced 24 ft. longitudinally, and approximately 21 ft. in the width of the hall. The outside rows are 24 ft. high, the second row 32 ft., and the two middle rows 36 ft. high, thus forming an arch. The illumination, provided by 300-watt pip-frosted gasfilled lamps, is found to be ample and very evenly distributed. There are no inconvenient shadows, and faciæ are well lighted in all parts of the hall. The consumption with the original arc installation was 19 k.w.; with the new gasfilled lamps it is 23·4 k.w.

We understand that the entire installation was carried out by Messrs. Jacob, White & Co. Ltd., of Islington, the official electrical engineers and contractors to the Royal Agricultural Hall Co.

An Electrical Exhibition at Leicester

A special display of good and bad lighting arrangements was arranged by the Electrical Association for Women at the Junior Training Halls, Leicester, during October 8th-17th. The exhibit was arranged with the co-operation of Mr. J. W. Beauchamp, Director of the E.D.A., and included many fittings and devices furnished by the E.L.M.A. Lighting Service Bureau. Amongst these devices were models showing the drawbacks of glare and the best means of eliminating it, and dealing with fundamental points in industrial lighting. In the course of the exhibition a series of lectures was given by Miss Margaret Partridge on domestic applications of electricity. Prominent local women councillors presided at these meetings, and the City Electrical Department, through its engineer, Mr. Smith, also co-operated.

We are glad to note the continued activities of the Association, and hope that they will succeed in interesting many women in lighting matters. As we have often pointed out, there are various fields in illumination which constitute an excellent field for women's efforts.

The Ethics of Salesmanship

At the meeting of representatives of the Salesmen's Circles of the British Gas Industry at Wembley, on September 30th, various methods of making the contact between the public and the gas undertakings more efficient were discussed. The Conference was opened by Mr. F. W. Goodenough (Executive Chairman of the B.C.G.A.), and Mr. Angus Watson delivered an address on "The Ethics of Salesmanship." One is glad to observe the recognition that *service* forms an important part of the duties of gas undertakings. We notice that in the course of the recent conference of the Industrial Welfare Society at Oxford one of the speakers quoted the gas industry as putting forth "an honest endeavour to make of their employees who come in contact with the public, salesmen rather than mere officials." It might be further said that the aim of progressive undertakings is to include in salesmanship the offer of service to the public—not merely to sell gas appliances, but to show people how to get the best use from them.

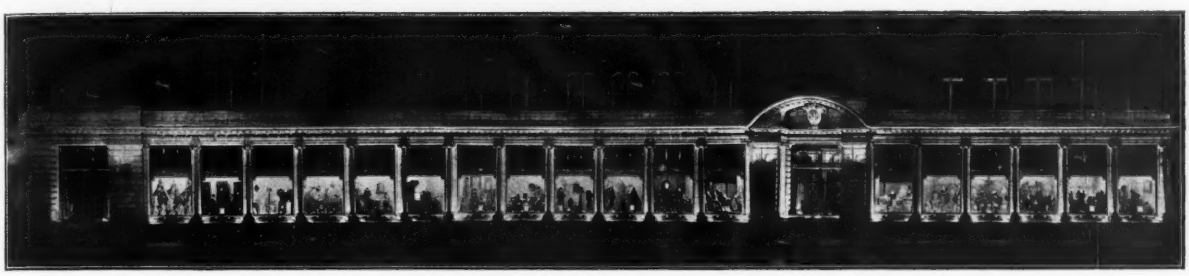
Abolition of German Import Licences

According to an announcement by the Board of Trade, from October 1st onwards the requirement of import licences was withdrawn for all commercial goods imported into Germany—except those (a small number) of which a list is given in *The Board of Trade Journal*.

SPECIAL SECTION

The Lighting of Shops and Show-Windows

Good Lighting—The "Silent Salesman"



A view of the frontage of a London Store, showing special flood-lighting.

IN the following pages a number of selected examples of modern shop-window lighting are described. They illustrate the fundamental principle of good window lighting—that light should be concentrated on the goods, but the actual sources concealed from view in the same manner as has been customary for centuries on the stage. Leading merchants recognize the value of good lighting as a selling force. An attractively lighted window forms one of the best and most economical methods of advertising—especially if windows are allowed to remain lighted after business hours, if necessary controlled by a special time-switch, so as to be automatically extinguished after a given hour. Some supply undertakings are prepared to allow special rates for such "after-hours" lighting.

Concealed Lighting.

It may be urged that a "bright light" is necessary to arrest attention, to attract the customer from afar. But, provided that lights are properly screened, there is practically no limit to the brightness of the illumination that can be advantageously furnished. In the United States, as is shown by a paper summarized in this number, experiments have even been made with illuminations sufficiently strong to cause show-windows to "stand out" during the daytime.

But, even assuming that the attraction of attention and the revealing of goods when the customer has arrived are separate processes, there are plenty of devices now available that will arrest attention without offending the eyes. Among these are the use of illuminated signs of relatively mild luminosity but artistic appearance, names outlined in the new neon tubes, and the flood-lighting of exteriors. The guiding principle is that any such extraneous effects must be so selected as not to render difficult the inspection of the windows at close quarters; they should arrest but not startle the eye.

The Use of Colour.

Equally valuable is the use of coloured light in the window, especially if operated by an automatic device giving constant changes in the hue of the light provided. Here again discrimination is necessary. The use of colour in order to attract attention should not be allowed to prejudice the appearance of the goods. If the wrong colours are selected, articles may not appear at their best! Here, as in other fields of show-window lighting, consultation between the window dresser and the lighting expert is needed.

Display Lighting.

The best effects are secured when "display windows" are adopted, i.e., the contents of the window are arranged to make a charming picture, frequently changed, and no attempt is made to include samples of all objects on sale. In cases where the window is crowded with miscellaneous articles brought quite close to the glass good lighting is more difficult to arrange, though even in this case there is no excuse for the use of unscreened lights amongst the goods—which are wearisome to the eyes and extravagant wasters of light.

The merchant has now at his disposal a far wider range of shop-lighting equipment than in the past. Windows may be lighted from above by special concentrating or diffusing units, or from a line of units along the top of the window directing light inwards. Supplementary lighting units at the base of the window may prove useful. "Spot-lights," or miniature search-lights, can be used to throw a beam and emphasize certain objects, if desirable in connection with changing colour. Overhead lights equipped with gelatine films give a range of colour never available in the past.

Artificial Daylight.

In shops devoted to drapery or fancy goods "artificial daylight" units are now available to enable the appearance of goods as seen by average daylight to be judged. These units necessarily absorb a good deal of light, and they are best used in special cabinets rather than for general illumination; they should, however, form part of the equipment of every store engaged in the sale of coloured goods.

In most cases effective lighting demands an illumination ranging from 10 to 30 foot-candles, though the latter value is now sometimes exceeded when specially brilliant effects are required. This illumination would require roughly up to 1·25 watts per cubic foot of window space, and it will be found that the cost of energy or gas is a very moderate item in comparison with the commercial value of the illumination.

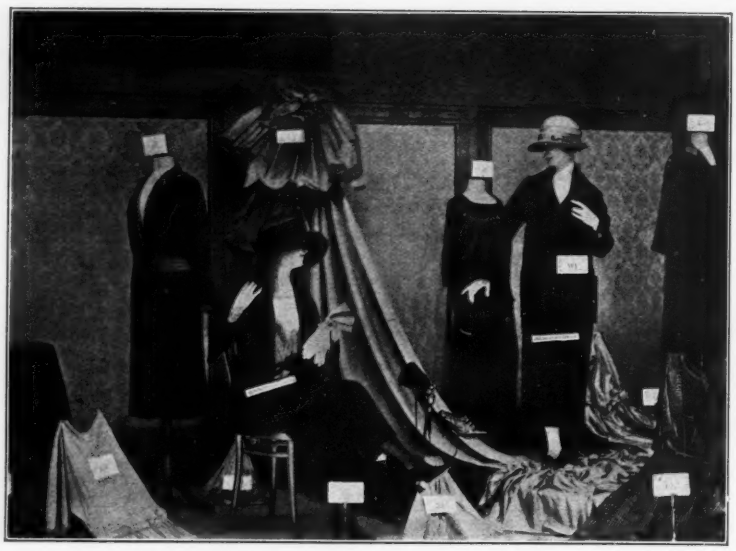
Good Illumination Attracts Custom.

In the best modern stores, in fact, the cost of lighting is regarded as of secondary importance, provided that *the best* is obtained. Experiments have shown conclusively that the number of people who stop to gaze at a window is increased when the illumination is raised to a high level. The use of colour-displays has an even more potent effect in increasing "drawing power."

Similar considerations apply to the lighting of shop interiors. Good illumination makes a favourable impression, and promotes speedy service, and there is good ground for thinking that it disposes people to purchase and thus directly increases the volume of trade, besides enabling more business to be handled during "rush-hours" and special sales.

A Well-Lighted Show-Window

THE adjacent illustration, for the use of which we are indebted to Benjamin Electric Ltd., shows how, by concealed lighting and judicious positions of the units, a somewhat remarkable effect was secured. Few people, viewing this picture, would imagine that it was taken solely by the artificial light in the window. The conditions are those which one would ordinarily associate with exceptionally good daylight illumination, a feature being the soft shadows, sufficient to show up the contours of faces of models, etc., and yet insufficient to produce any distracting effect. The complete degree of diffusion is especially illustrated by the appearance of the legs of the stool in the foreground—the dense shadows often associated with artificial lighting being markedly absent.



A close view of a well-lighted show-window, showing excellent diffusion and shadow effects.

Coloured Spot-Lighting

THIS picture, which has been sent to us by Messrs. Siemens and English Electric Lamp Co. Ltd. illustrates the use of "spot-lights" to show up certain objects in a show-window. The background in this case is allowed to appear somewhat dark in order to emphasize the effect, but in practice any desired degree of contrast can be arranged.

The effect is particularly striking when spot-lights of changing colour are employed. Here again the striking nature of the effect depends greatly on the contrast in colour. Complementary colours often give the best result. The use of colour in this way, in order to attract attention, is a useful asset, but the influence of coloured light impinging on goods that are themselves coloured must be considered—in other words, the colour of the object and the hue of the object illuminated must be selected with due regard to the joint effect.

Two Striking G.E.C. Installations

ON the opposite page we reproduce, by the courtesy of the General Electric Co. Ltd., two striking examples of shop lighting, one an interior, the other a well-lighted window. The system of general lighting with enclosed diffusing units of a dust-proof character, illustrated in Fig. 1, is now very popular, the aim being to produce a flood of abundant and well-diffused illumination which will answer for any desired arrangement of goods. The window (Fig. 2) strikes one as showing how, by proper methods, a remarkable amount of detail can be revealed even when the window is filled with a considerable number of articles. A feature of the picture is the complete absence of any sign of the lighting units, so that the attention of the spectator is entirely concentrated on the display.

Recent Electrical Exhibitions

AT this time of the year one looks for exhibitions of electrical goods in the chief cities, and during October quite a number of such shows have been arranged. There has been, for example, the Nottingham Electrical Exhibition, arranged under the auspices of the Electrical Contractors' Association, where we understand, that the British Thomson-Houston Co. Ltd. had on view a particularly good range of lamps and lighting appliances for industrial, commercial and domestic use.

Our attention has also been directed to the All-Electric Exhibition organized by Mr. T. Percy Bentley in the Junior Training Halls, Leicester. A feature on this occasion was the advertising of the exhibition by means of an electric sign mounted on one of the tramcars of the Leicester Corporation. We understand that Mr. Bentley is also supervising an important Housing and Building Exhibition to take place in Edinburgh in February next, under the patronage of the Lord Provost, Council and Magistrates of that City. We should imagine that this exhibition would also furnish a good opportunity for the display of lighting by various illuminants. It may well be considered whether the time is ripe for an exhibition devoted solely to lighting and illumination, all the chief illuminants being represented. Such a project, if properly organized, should receive considerable support.

FIG. 1.—An excellent example of showroom lighting; part of the installation of Messrs. Harrison & Gibson, House Furnishers, Ilford, lighted by G.E.C. " Unalux " units and Osram Lamps.

FIG. 2.—One of the windows of Messrs. Thornton & Simpson, Grocers and Merchants, Kingston-on-Thames, who have recently installed the GECoRAY system to light their window displays. A feature of this picture is the great amount of detail revealed by the high illumination provided.

THE above illustration, which we have received from Messrs. H. G. Sproates & Co., of Middlesbrough, is as reproduced an example of successful dealing with a somewhat awkward problem—the lighting of the window, which is filled with goods brought quite close to the glass. The method of concealed lighting is based on the use of a trough reflector placed immediately behind the facia or blind at the top of the window. Careful attention to the angles was necessary to ensure all the light coming from *in front* of the objects, thus avoiding unsightly shadows. Another feature is the even lighting at top and bottom. The design is in accordance with the approved motto, "Light on the object, not in the eye," as in no part of the window is there any evidence of glare.

THIS picture, which recently appeared in *Holophane Illumination*, likewise represents the results of effective lighting from the top of the window, Holophane reflectors being used. It will be noted, however, that in this case no attempt was made to render the window a "catalogue" of contents. On the contrary, the scene is contrived to show off a few choice objects, and to present a charming picture. In these circumstances the very best results are obtained from scientific methods of window-lighting. The show-window is treated like the stage of a theatre. The actual light-sources are invisible, but the contents of the window are flooded with light. A tableau, such as that here illustrated, affords a particularly good opportunity for the use of concealed lighting.

The "Light Craving"

"Light," Lady Frances Balfour is reported to have said at the Conference of the National Council of Women, "is like drink. The more you have, the more you want." This may be true, but is the craving to be regretted? People reared in dim illumination desire no more, because they know nothing better. Enjoyment of moderately good illumination teaches them for the first time how inconvenient and troublesome poor lighting has been. Certainly there are few of us who would sigh for the dim lights of the past. And how many women who do needlework in the evenings would like to go back to work under the old conditions?

Some Notes on Shop-Lighting in Czecho-Slovakia

By Prof. Dr. F. NIETHAMMER (Deutsche Technische Hochschule, Prague)

IN resumption of the notes contributed to the August issue of *The Illuminating Engineer*, I propose now to give some details of methods of shop-window lighting.

It is now agreed that the fundamental principle is to conceal the light sources from the eyes of spectators, and also to direct the light in such a manner that there are no direct reflections of these sources in the window-glass or other polished surfaces.

In the first series of illustrations (Figs. 1-6) some typical arrangements for distributing light in windows are shown. All of them comply with the principle that the sources must be shielded. In Fig. 1 we see a usual arrangement in which concentrating light-units are placed at the top of the window, behind some form of curtain or facia. In Fig. 2 there is a similar arrangement, except that a screen of diffusing glass is placed below the lamps—a useful method when it is desired to eliminate completely any inconveniently dense shadows. In Fig. 3 we see a window illuminated with diffusing fittings.

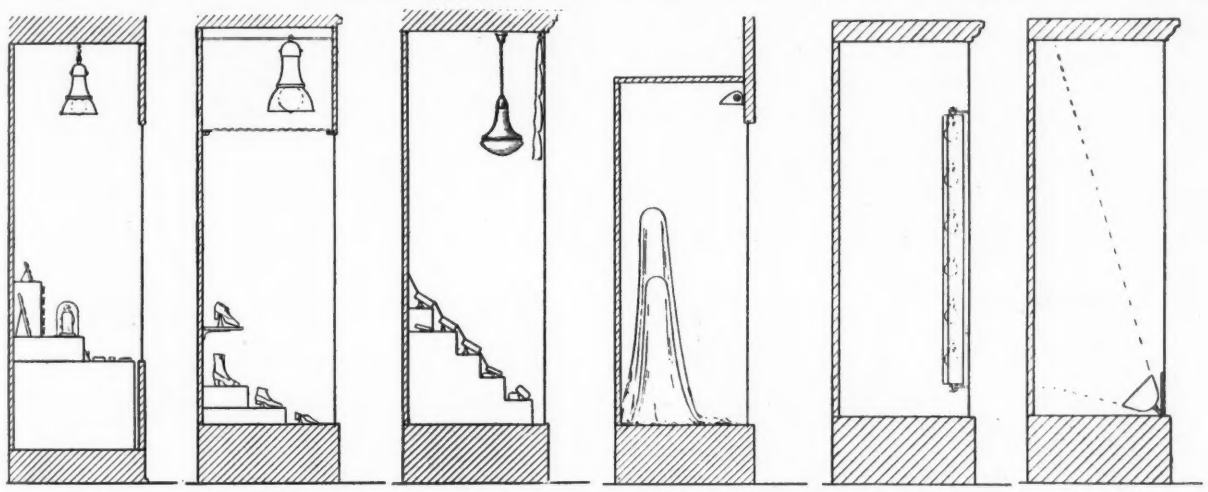


FIG. 1. FIG. 2. FIG. 3. FIG. 4. FIG. 5. FIG. 6.

Showing Methods of Shop-window Lighting.

In Fig. 4 we see a usual arrangement of lights along the top of the window, and in Fig. 5 window lighting with lamps in vertical trough reflectors. A fitting of a type for use along the window top, developed by the A.E.G., utilizes eight lamps on each length of one metre, the lamps being enclosed in shells painted white on the inside and the light transmitted through diffusing glass. This form of lighting is adapted for windows with a depth of 1·6 metres (say 5 feet) or more. In some cases it is desirable to help out the lighting with supplementary lamps at the base of the window, in the manner shown in Fig. 6.

Figs. 7a and 7b are reproduced to show an extreme contrast between bad and good lighting. The two pictures show adjacent shops in the Narodni Trida, in Prague. The shop shown on the left hand is concerned with the sale of leather goods, handbags, etc., and is lighted by three bare gasfilled lamps placed right in the middle of the window. The glare of these exposed filaments makes it almost impossible to see the goods exhibited. The window on the right is that of the Unie Company, and is devoted to pictures and the graphic arts. The illumination in this case is excellent, the effect being even better than by daylight, as will be seen from Fig. 8, which is a photograph of both shops taken in the daytime.

FIG. 7.—(a) Unsatisfactory lighting and glare. (b) Good lighting from concealed units.

FIG. 8—The same windows by daylight.

For the concentration of light downwards good results have been obtained with Wiskott mirrored reflectors or Zeiss and Goerz parabolic reflectors. These reflectors have recently been tested by us in the German Technical University at Prague. It was found

that four bare lamps gave a much weaker illumination than two lamps in Wiskott reflectors, i.e., only 95 lux with an expenditure of 300 watts, as compared with 112 lux with only 150 watts; for equal illumination the saving in energy is thus about 57 per cent. Confirmatory results were obtained from polar curves tested out in the laboratory—the increase in illumination secured by the use of reflectors being in some cases as much as ten times, all the light being concentrated downwards within $\pm 30°$. The curve can, however, be considerably modified by altering the position of the lamp in the reflector. With Zeiss mirror reflectors an even more striking effect was obtained, 160 lux being obtained by two 100-watt lamps in reflectors of this type, whereas two 500-watt bare lamps were needed to produce the same illumination. These figures will serve to show what an important part reflectors may play in shop-window lighting. Another form of fitting adapted for lighting shop interiors is the Erliwell type with a waved reflector, a feature of which is the good ventilation.

Two further illustrations may be of interest. Figs. 9 and 10 show the same window as seen by daylight and artificial light, and again emphasize the striking difference in the effects. Fig. 11 shows a window of a clothing store in the Riunione Palace at Prague, well lighted by the trough system already illustrated. Windows may be quite effectively lighted by vertical rows of lamps in suitable troughs or reflectors; it is, however, very necessary to shield the lamps, as the effect of reflections in glass or polished surfaces may be very disturbing. In addition, flood-lights or "spot-lights" are now being used to emphasize some special object in the window. Lamps in shop windows may be automatically controlled by a time-switch. It may be interesting to mention the fact that an increase from 150 to 400 lux has been found to attract 38 per cent. more people to a shop window.

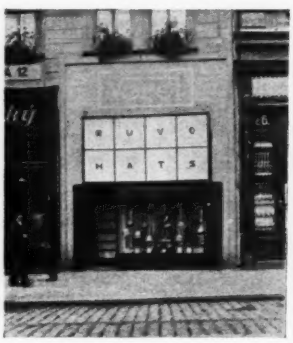


FIG. 9.—Window by daylight.

FIG. 10.—Window by artificial light.

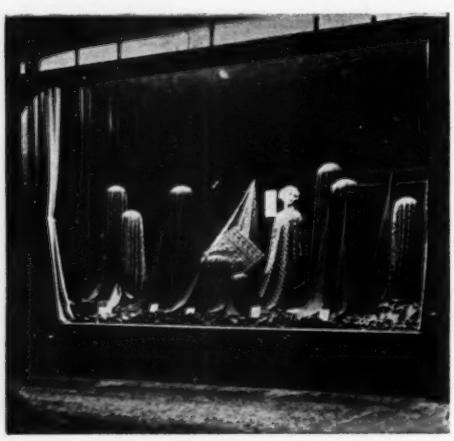


FIG. 11.—A clothing store lighted by the trough system.

FIG. 12.—An effective illuminated sign.

Attention has also been given to methods of illuminating the name of the proprietors of the shop, besides the window. This may be effected (1) by arranging metal troughs having letter-shapes and filled with a series of lamps. In Fig. 12 we have a glassware shop exbiiting ware from the Bohemian Forest (Winterburg) on the Graben at Prague. The name "Moser" is lighted in the manner described, whilst the window is illuminated by vertical rows of tubular lamps (the disagreeable effect of reflections from such lamps, mentioned above, is clearly shown).

In some cases illumination of names is carried out by flood-lighting methods, or by transmitted light or "silhouette" effects, in which cases all manner of colour combinations may be used. Neon tubes, in the form of letters, consuming 20 to 80 watts per letter) are being largely used for signs, whilst a white light, resembling daylight, is obtained from the Moore tubes.

The general principles of good lighting in shops have much in common with those for all interior lighting. In shops where reflection from white walls and ceilings may be utilized semi-indirect or indirect lighting has advantages. In cases where surroundings are dark in colour, fittings with good white diffusing inner surfaces or mirror reflectors, of the types already described, may be used. Specially useful are dustproof forms consisting of a diffusing opal glass lower portion and clear glass upper portions.

The Siemens dustproof "Luzette" fitting is an example. It may be made either in the direct or semi-indirect form (by the selection of suitable materials for the glass elements at top and bottom). Such diffusing units are also being constructed of special blue glass for the purpose of giving artificial daylight, but, in general, such units are best applied to produce local lighting for colour-revealing purposes. General illumination by artificial daylight gives a somewhat cold and pale effect if the illumination is below about 200 lux (20 foot-candles), and the absorption of light is considerable.

Enclosed arc lamps with impregnated carbons are again coming into use for lighting very large interiors; as an instance may be mentioned the Dia-Carbone Lamp of Korting and Mathiesen, of Leipzig, with a hemispherical intensity of 2,000 to 3,600 candle-power and a consumption of 0·18 to 0·22 watts per candle. This lamp will burn for 120 hours without recarboning.

Leave the Light in Charge

In many retail trades the window display is of paramount importance, the contents and arrangement represent expenditure of money and skill; the result can make or mar a business.

The Use of Electric Light

Is the foundation of the art of window display; its beauty, ease of adaptation and colour value make darkness more valuable than daylight to the retailer.

EARLY CLOSING severely limits the hours of buying.

LATE LIGHTING doubles the hours of selection and choice.

By leaving the electric light burning until 10 or 11 p.m. each evening people are induced to stroll in a thoroughfare which would otherwise be deserted; they are attracted to window displays and can be interested in goods and prices at a time when they have the leisure to realize their wants and exercise judgment in satisfying them.

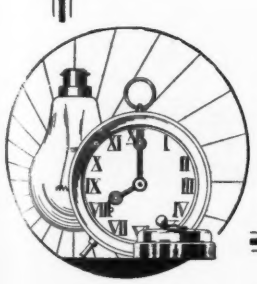
The window which is lighted after closing time is booking customers for the shop next day

Ask your Local Electrical adviser to tell you the cost per hour of lighting your windows. Compare it with the rent you pay for them and the value of additional turnover.

Shorter shopping hours and daylight saving leave but little time in the year between dusk and closing; the strongest appeal of the window is limited to that short period but it can be *doubled* by putting an *Automatic Clock Switch* in charge of the Electric Lighting.

Easy to fix, reliable in action, winds like a clock and can be set to switch on or off at any hour; or at different hours on different days of the week.

People buy where the Light is Bright



THE BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION, INC.
15, SAVOY STREET STRAND, W.C.2.

A Demonstration of Shop Lighting

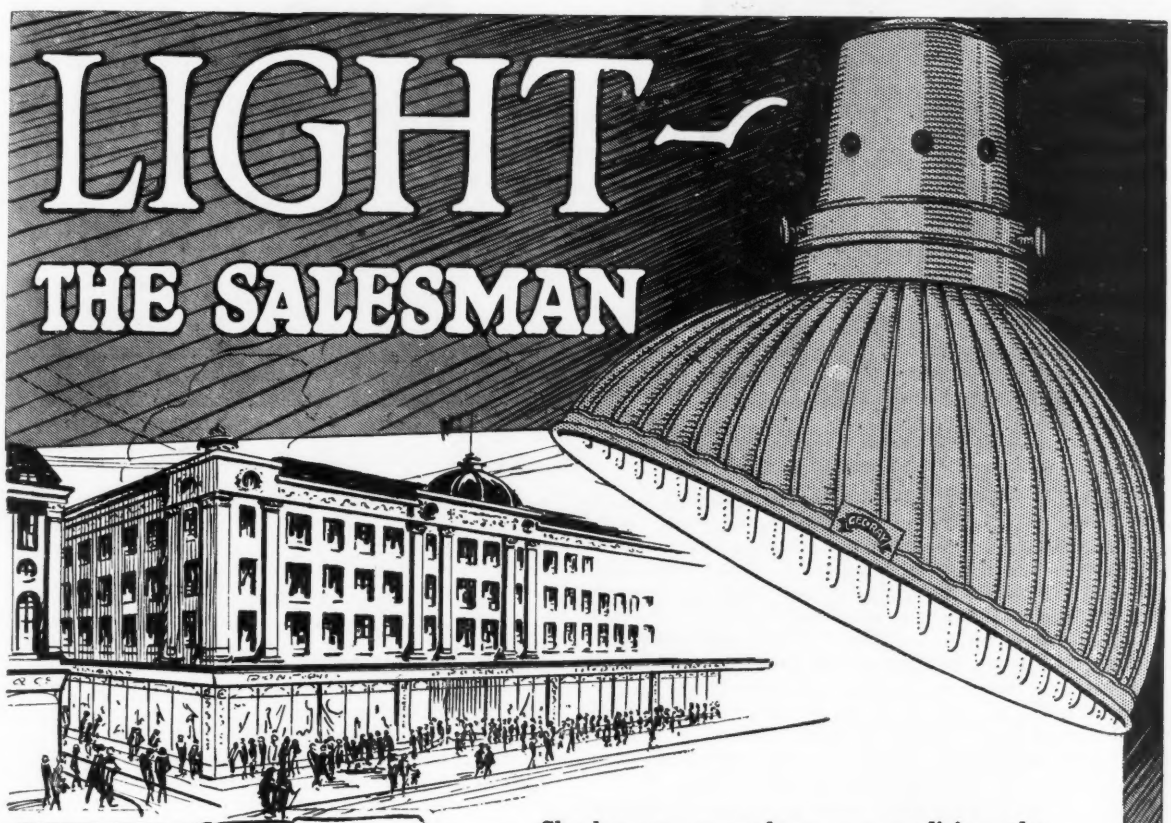
FIG. 1.—View of the Hall of the E.L.M.A. Lighting Service Bureau, where the Demonstrations took place.

IN our last issue we referred to the demonstrations of shop-lighting which are now being given at the premises of the E.L.M.A. Lighting Service Bureau, and we are now able, by the courtesy of the Bureau, to give some views of these exhibits. We had also an opportunity of witnessing one of the demonstrations on October 8th, when a number of representatives of the British Association of Display Men were present. The lecture, which was delivered by Mr. R. C. Hawkins, contained many telling illustrations of the benefits of scientific shop-lighting. The familiar model box with bull's-eye was used to show how a bright light in the field of view defeats the salesman's object, and in model windows the same effect was again shown—a row of bare gasfilled lamps and properly concealed lighting being used in succession. Mr. Hawkins quoted from the paper recently read before the Illuminating Engineering Society by Messrs. W. J. Jones and H. Lingard, showing what a large proportion of shops still utilize unscientific methods of illumination. There were also the familiar experiments with small model windows showing how direction of light affects shadows, and illustrating the appearance of coloured pictures by artificial daylight and gasfilled lamps.

The chief feature of the demonstration, however, was the shop-lighting exhibits on a larger scale, to which reference was made in our last issue. The accompanying illustrations give a good idea of these, though naturally a photograph never gives quite the vivid effect experienced by the eye. Fig. 1 shows a view of the hall, with diffusing lighting units overhead and a model counter running down the side. Other views of two model counters are seen in Figs. 2 and 3. These were dressed with actual models of goods as used by well-known merchants (Fuller's confectionery, Lotus boots, etc.), and arranged in the familiar way with which they are identified. The arrangement of lighting units thus gave a capital idea of modern shop-interior lighting. We referred in our last issue to a somewhat dramatic innovation—the descent at the appropriate moment of lighting units through an open ceiling. By this means good and bad lighting were effectively compared. Thus, when the ceiling over the counter opened and three obsolete pendant units descended, one saw all the faults of glare, ineffective distribution of light and insufficient illumination. Next these were removed, and in place

FIGS. 2 AND 3.—Two views of Model Counters equipped with actual Goods supplied by different firms, illuminated by diffusing units overhead.

LIGHT—
THE SALESMAN



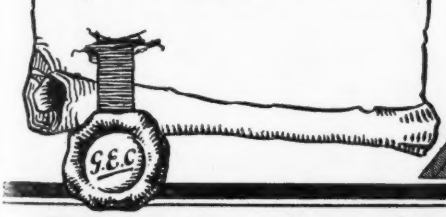
Shopkeepers everywhere are realizing the powerful selling influence of LIGHT, and are keenly interested in hearing of developments and progress that are being made in the design of electric light fittings that give BETTER LIGHT for the current consumed.

The improvement in shop window lighting made possible by the "GECORAY" SYSTEM has aroused widespread interest of shopkeepers throughout the country. A practically unlimited range of shop window lighting effects—colour lighting, spot and flood lighting in infinite variations and combinations—is available by the introduction of this system, which cannot fail to be appreciated by everyone concerned with better shop window lighting.

The G.E.C. have installed demonstration shop windows at Magnet House, Kingsway, London, W.C.2., and at their principal branches, in Birmingham, Cardiff, Glasgow, Leeds, Liverpool, Manchester, and Newcastle, which demonstrate in a practical manner the "GECORAY" Shop Window Lighting System. You are cordially invited to see these windows, and also to enlist the co-operation of the G.E.C. Illuminating Engineering Department in the preparation of any shop lighting schemes in which you are engaged.

5 years Guarantee

We hereby guarantee for a period of 5 years from date of purchase to replace free of charge any GECORAY Reflector that checks peels or tarnishes if used with the Lamp specified



GECORAY
SYSTEM OF SHOP WINDOW LIGHTING

"The WAY TO BETTER SHOP LIGHTING" is the title of an informative fully-illustrated folder that has been sent to thousands of shopkeepers. A copy will gladly be sent to Illuminating Engineers on request to G.E.C. Publicity Organization, Magnet House, Kingsway, London, W.C.2.

PEOPLE BUY WHERE THE LIGHT IS BRIGHT.

Advt. of The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2

FIG. 4.—A charming Model Window where changing coloured lighting is demonstrated.

FIG. 5.—Another Model Show Window, where varieties of concealed lighting may be demonstrated.

of them bare gasfilled lamps appeared—also unsatisfactory. Finally, modern diffusing units, equipped with gasfilled lamps and showing the advantages of bright illumination coupled with absence of glare, were substituted. By means of dimmers the contrast between relatively dim and brilliant illumination (with the same units) was shown; also the effect of blue glass lamps in diffusing glassware, producing a general daylight effect.

All these experiments showed very clearly the merits of *an appeal to the eye*, as a supplement to the spoken word. In illuminating engineering "seeing is believing" to an exceptional degree, and demonstrations such as these form an excellent educational medium.

The two final illustrations show the model windows arranged at the entrance to the hall. That on the left was devoted to colour-effects. Various concealed units with coloured gelatines were supplemented by a spotlight equipped with a slowly rotating disc with various coloured screens. This spotlight was trained on the vase in the centre filled with glistening artificial flowers and foliage. The choice of this central object to receive the changing coloured beam was apt. The effect as the colours of foliage changed according to their inclination to the beam and the general lighting was quite striking. For a display of this kind the selection of a central object with some degree of "sparkle" is probably an important element in success.

The other model window (Fig. 4) was devoted to ordinary lighting, without colour effects, though provision was made for wide alteration in the intensity and distribution of light. This window was filled with Pears' Soap exhibits, one ingenious expedient being the lighting up by transmitted light of the cakes of soap mounted in the three pyramids. Lamps concealed in these pyramids caused the soap to shine out brightly against the black background, especially when, by means of a flasher, the general illumination was somewhat reduced. Little expedients of this kind are very helpful in attracting attention to a window, and for this purpose are much to be preferred to any attempt to draw notice by means of masses of unscreened filaments!

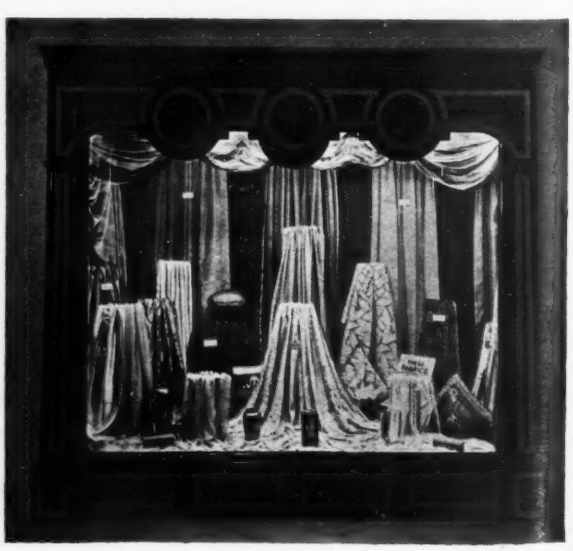
The exhibit was evidently appreciated by the members of the British Association of Display Men, whose Chairman, Mr. Wilson, said a few words of thanks to the E.L.M.A. Lighting Service Bureau at the conclusion of the proceedings.

The Scottish Electric Lighting Service Bureau

The Scottish Electric Lighting Service Bureau, which is sponsored by the Glasgow Electricity Department, the Electrical Contractors' Association, the Supply Undertakings, the E.L.M.A., and Scottish electrical interests generally, was opened by the Lord Provost of the City of Glasgow on October 12th.

The Bureau is established at 20, Trongate, Glasgow, and, like the corresponding institution in London, it aims at popular education in proper methods of electric lighting. Mr. S. B. Langlands, the chairman of the Committee of the Bureau, is the manager of the Glasgow Corporation Lighting Department, and will be known to our readers as a member of the Illuminating Engineering Society of long standing. The Committee, whilst adapting methods to Scottish conditions, has made use of the experience acquired by the London Bureau, and demonstrations on similar lines have been arranged. The accompanying illustration, for instance, shows a model show-window lighting installation, enabling good and bad lighting methods to be compared, and the effects of coloured light, "spot-lights," etc., to be shown. The new demonstration rooms are completely equipped for other displays, such as domestic lighting. It is hoped that a general advance in lighting in Scotland will result from its demonstrations of the principles of good lighting, which the Illuminating Engineering Society has been insisting on for so many years—special attention being devoted to the elimination of glare from misused gasfilled lamps.

The Bureau is under the charge of Mr. Henry E. Hughes (also a member of the Illuminating Engineering Society) in the capacity of District Engineer, and the development of its educational work in Scotland will be watched with great interest.

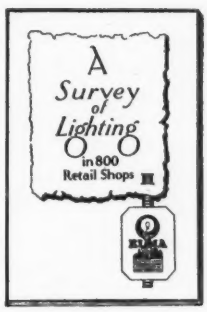


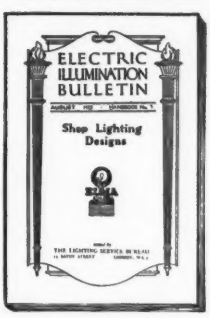
A view of the Model Shop Window being shown at the premises of the Scottish Lighting Service Bureau.

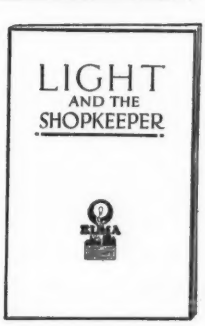
Better Lighting for the Shopkeeper

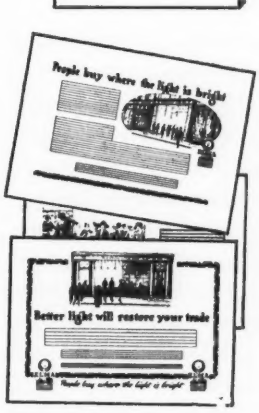
A great autumnal campaign is being launched by the Electric Lamp Manufacturers' Association with a view to awakening the shopkeeper to the poverty of modern shop-lighting as a whole; and to the potentialities of *right* lighting as a sales-force.

A series of booklets is being issued early in September as a first step in the campaign. These will be supplemented by advertisements to be inserted in trade journals covering the whole shop-lighting field. The special "Light as a Sales Force" brochure will be posted direct to every shopkeeper of standing in the Kingdom. In addition, lectures upon the subject will be given in large centres.









ELMA
ELECTRIC LAMP MANUFACTURERS' ASSOCIATION OF GREAT BRITAIN LTD

The **LIGHTING SERVICE BUREAU**
15, SAVOY STREET, LONDON, W.C.2

Issued by the Electric Lamp Manufacturers' Association.

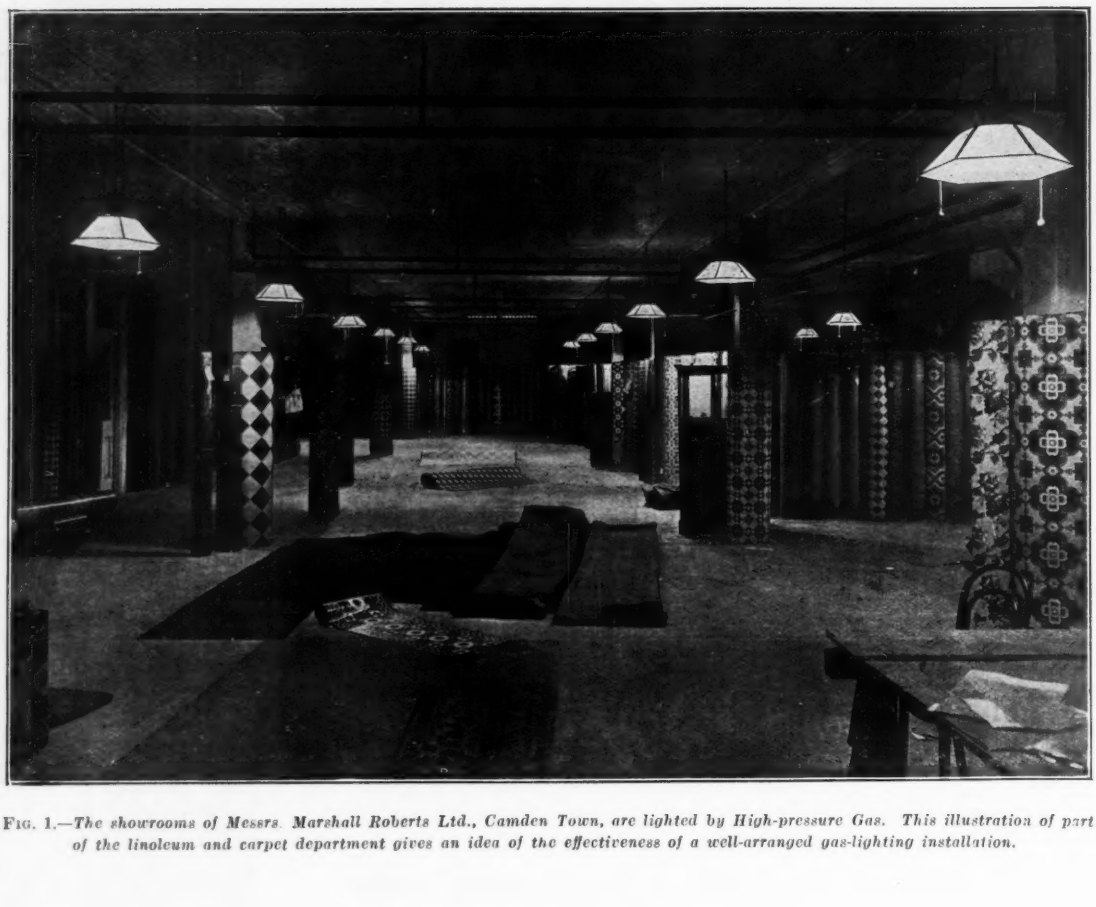


FIG. 1.—*The showrooms of Messrs. Marshall Roberts Ltd., Camden Town, are lighted by High-pressure Gas. This illustration of part of the linoleum and carpet department gives an idea of the effectiveness of a well-arranged gas-lighting installation.*

Shop Lighting by Gas

A Profitable Form of Advertisement

OUTSIDE shop lighting in many towns ceased to exist during the war. Since then some shopkeepers, on the grounds of supposed economy, have been slow in reverting to the sound practice of having the exterior of their premises brilliantly illuminated. Gradually, however, those rather too conservative business men are being forced by others who are more progressive to recognize that outside lighting of the right type makes the shop or row of shops a centre of attraction and creates business. Many of the leading shopkeepers now leave their windows fully lighted up to a late hour every evening, even though the shop may be closed for business. This means of advertising has been the subject of very favourable comment of late in business circles and in the press, and it is difficult to find any sound argument against it. For the comparatively small cost representec by the gas-lighting bill the advertising value is considerable. Especially is this the case as regards shops which close at a rather early hour, for the system enables the shopkeeper in question to show his goods under attractive conditions to many potential customers who are at business during the daytime, and whose opportunities of seeing what is on sale are limited mainly to hours after six o'clock in the evening. Clockwork controlled taps can be used to extinguish the lights at any predetermined time, and the necessity for personal attention to this matter at a late hour of the night can thus be avoided.

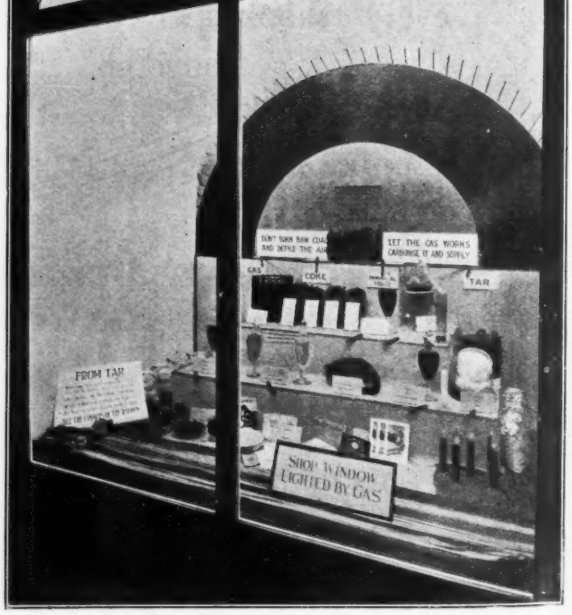


FIG. 2.—*A beautiful example of window lighting by means of Concealed Low-pressure Inverted Incandescent Gas Burners.*

FIG. 3.—*The interior of this grocery stores is lighted by eight single Inverted Incandescent Gas Burners attached to simple drop pendants. The articles exhibited for sale are well illuminated, and the mantles are suitably shaded.*

In co-operation with their neighbours, too, many enterprising tradesmen are stimulating business in their district by having systems of parade lighting installed; that is to say, by having lamps of standard design and illuminating power fixed at regular distances right along a row of shops, the lamps being fixed either on brackets attached to the buildings or on lamp standards set up along the pavement. In these cases the local gas undertaking generally supplies and installs the lamps, lights and extinguishes them, and maintains them in good lighting order for a fixed quarterly or annual charge per lamp. The section of street so lighted stands out prominently at night-time, and so attracts the crowd. In streets along which there is a high-pressure gas main, high-pressure gas lamps are, of course, used, in view of the very high efficiency obtained. Where there is no such main, the superheater cluster-burner gas lamp is adopted, as this type of burner gives a much higher efficiency than the ordinary low-pressure gas burner, in addition to which the average life of the small mantles with which it is equipped is longer than that of larger ones, and thus reduces maintenance costs.

For lighting the interior of the shops this superheated type of incandescent gas burner is equally suitable. Its light approximates very nearly in quality to daylight, and it is therefore particularly to be recommended for use in shops in which the colour of the goods is a definite factor in their choice.

The type of fitting to be employed for the lighting of the shop interior will, of course, vary in accordance with the design of the shop and the nature of the business. Adequate and well-diffused illumination must, however, be provided in every case to ensure that the goods displayed in every part of the shop may be seen distinctly without entailing any special visual effort on the part of the customers.

The "semi-indirect" gas-lighting fitting, with opal or silica ware bowl, is becoming deservedly popular for use in shops. The light given is well diffused and the fitting is dignified; but it must always be remembered that this system of lighting (by means of which the bulk of the light is first directed on to the white ceiling, and then downward) is slightly more costly than the "direct" system, as a certain amount of light is absorbed in the passage of the rays from the mantle to the bowl, from the bowl to the ceiling, and thence downwards into the shop. Where the "direct" system of lighting is installed, lighting fittings should be chosen (and are now readily obtainable) of a simple design which will not harbour dust, and which can be easily and rapidly cleaned. Silica-ware globes and shades will be found particularly suitable in most cases, not only on account of their long life (they successfully withstand all heat from the burners without breaking), but because of their simple and attractive design, and of the pleasant colour and subdued and restful effect of the light which passes through them.

FIG. 4.—*Semi-indirect Gas-lighting Pendants in a boot and shoe shop. The evenness of illumination and almost complete absence of shadow is a feature of this system of lighting. Fittings of this type are not very expensive, and they are undoubtedly dignified in appearance.*

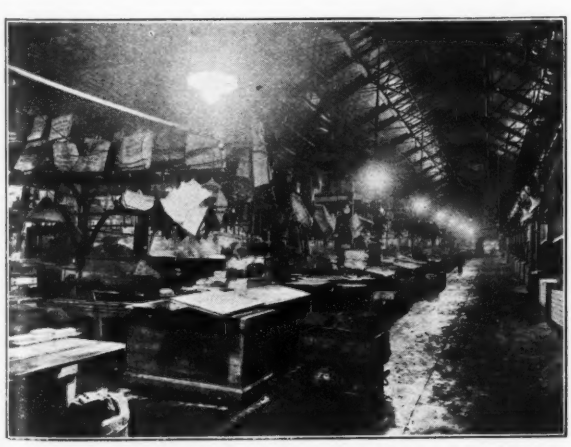


FIG. 5.—*A night view of part of Fitzalan Market, the chief shopping centre of Sheffield. The thirty-two Gas Lamps each of about 180 candle-power, have been in use for 16 years, and are still in good condition.*

Some time ago the question was raised as to whether artificial lighting had any deleterious effect on coloured fabrics. Arrangements were therefore made for severe tests to be carried out to determine what, if any, effects

gas lighting had on coloured fabrics. To this end, six sets of coloured materials (silk and cloth) were exposed in the following ways: The first set to all the effects of gas lighting—temperature, illumination and products of combustion; the second to temperature and products of combustion; the third to illumination and temperature; the fourth to temperature only; the fifth to daylight; while the sixth set was carefully preserved in a sealed envelope in a cool place away from heated air and products of combustion, to serve as a standard of reference for ascertaining the extent of the deterioration in the colour of the exposed specimens.

After a period of ninety days the results were annotated. In only two cases—the bronze green and the dark red—was any change visible in the materials exposed to the effects of gas lighting, and these changes were of no practical importance, since the bronze green had lost only a little of its glossy surface, while

FIG. 7.—*The parabolic reflectors fixed on the three Cluster Gas Lamps which light up this window effectively screen the naked source of light from the eyes of the passers-by. That they also direct the light in the right direction will be obvious on examination of the illustration.*

keeping its colour intact, and the dark red had become slightly brighter. On the other hand, every single one of the colours exposed to daylight effects had deteriorated, in many cases to a very appreciable extent. These results should amply prove to every draper that his store of materials will in no way suffer if he does the wise, the hygienic and the economical thing, and installs efficient gas lighting in his shops.

On the question of the initial cost of gas lighting installations, it should be pointed out that at the present time it is possible to obtain gas lamps and burners of artistic design and of high efficiency at very little (if any) more cost than fittings which are of really poor design and low efficiency. Such high-class fittings can now be seen in the showrooms of most gas undertakings. Shopkeepers who pay a visit to these showrooms to see the newest lamps should specially ask to see (or have explained to them) the new and dependable devices which can easily be fitted to shop lamps to enable them to be lighted and extinguished by the turning of a tap fixed at a distance in some convenient position inside

FIG. 6.—*Gas lighting—brilliant but without glare. The opal screens fixed to the lamps direct the light on to the books, screen the source of light from the eyes of passers-by and provide an illuminated surface on which the familiar "W.H.S." design can be displayed.*

the shop. The employment of these devices is to be recommended as a great convenience, and it also prevents the disturbance of customers at lighting and extinguishing times.

To obtain the best results from gas lamps and burners it is essential, however, that they should be kept in good condition. Most gas undertakings will now, for a reasonably low charge, send competent men regularly to overhaul and maintain the burners, and where this valuable service is available full advantage should be taken of it.

A well-arranged installation of modern and efficient lighting fittings, suitably shaded and properly maintained, will bring so much custom to the progressive shopkeeper that its initial and running costs will sink into insignificance.

It is impossible to emphasize too strongly the fact that the lighting of the interior of *each* building is an individual problem to be solved by individual attention if the best results are to be achieved. So varied are the individual needs of different owners, and so great the strides in the science of illuminating engineering during recent years in solving the problems, that even those who are satisfied up to a point with their installations will be well advised to see if they can improve their lighting arrangements, either in the direction of economy or efficiency, or both. The lighting experts of the gas industry are at the service of gas users or prospective gas users without fee or obligation. It only remains to call upon them for advice.

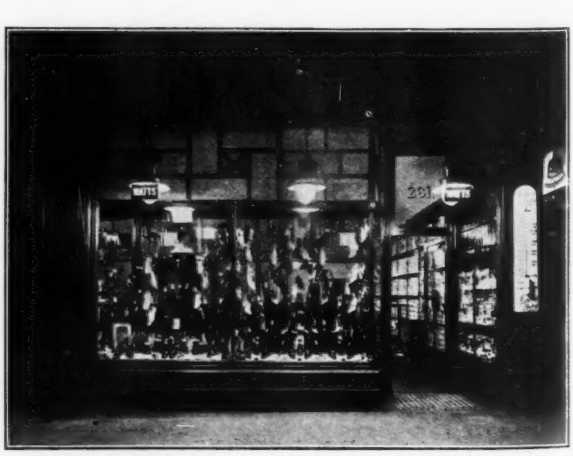
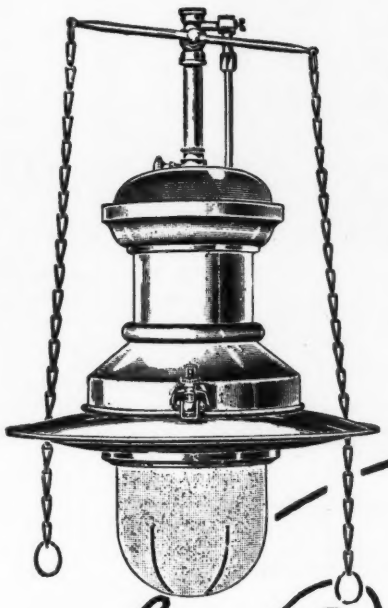


FIG. 8.—*Three Superheated Low-pressure Inverted Incandescent Gas Lamps light the exterior of this boot and shoe shop. The screens fixed in front of the lamps are utilized to advertise the name of the proprietor of the shop.*



'Calshot' LAMPS

THESE Three-Burner Indoor Superheated Lamps are of neat and attractive appearance, highly efficient, and attractively finished. Aluminium Casing and Reflector are polished, other external parts Nickel-Plated. Fitted with By-pass, Double Levers and Chains, Medium Inverted Mantles and Globe, All-Metal Gas Regulator, with slotted Arm, and screwed Air Adjuster.

NO INNER GLASSES REQUIRED

For full particulars write to the

WELSBACH

LIGHT COMPANY, LTD.

Welsbach House,
King's Cross, London, W.C.1

PPS 494.

FIG. 9.—*The Ashbourne branch shop of Messrs. Burgons Ltd., of Manchester, was opened in the summer of 1924, and was equipped with an up-to-date Gas Lighting Installation. The contents of each window are well illuminated by three 300-candle-power gas lamps fixed in the interior of the window. Eleven gas lamps are used to illuminate the interior of this modern store, which is attracting good business.*

FIG. 10.—*An excellent piece of parade lighting by High-pressure Gas Lamps. It will be noted that in this case the lamps are suspended from brackets, and that the majority of them are placed well above the windows, their light being required not solely to illuminate the windows, but to attract crowds to the parade by their own brilliancy and the increased general illumination of the street.*

FIG. 11.—*One of two shopping parades in Dunstable Road, Luton, which are made specially attractive at night-time by powerful Gas Lamps on swan-neck columns. The exteriors of the lamps and columns are painted in aluminium. The shopkeepers each pay to the gas undertaking a fixed quarterly sum, in return for which the gas undertaking provides and fixes the lamps and columns, and lights, extinguishes and keeps them in good order.*

TRADE NOTES & ANNOUNCEMENTS

"CRYSELCO" OPAL LAMPS.

A series of leaflets referring to "Cryselco" lamps raises several useful points in regard to domestic and exterior lighting. Apart from the data given in regard to standard types of these lamps, special reference is made to the opal variety, utilizing bulbs having a clear glass lining and an opal skin. The smooth and polished exterior is naturally an advantage in positions where lamps are liable to collect dust, and the absorption of a layer of opal is stated to be unusually low. Another point mentioned—which we believe is not generally known—is that opal glass itself is liable to give off impurities when heated. Hence in a lamp with a bulb composed of opal glass throughout these impurities are liable to react on the filament and cause premature failure.

The value of such lamps in street lighting, when it is desired to increase the existing candle-power by the substitution of gasfilled lamps without at the same time increasing glare, is also pointed out. Furthermore, the admitted drawback of most exterior lighting, as compared with interior lighting, is that the lamps are necessarily far apart; hence deep shadows are apt to be caused and objects are illuminated from one or two directions only. The use of opal bulbs does something to mitigate this drawback, as the light comes from a bigger luminous surface and the shadows are softer. The accompanying illustration shows an interesting recent installation of these lamps—at Waterloo Station, where it was desired to illuminate the roof and upper portions of the walls to some extent and relieve the otherwise rather sombre appearance.

In the catalogue devoted to "Lighting Notes" another valuable feature of such lamps in domestic lighting is pointed out. Their use with a semi-indirect bowl smooths out the unsightly dark edge where the shadow of the rim of the bowl impinges on the walls. In addition, the surface of the diffusing bowl itself appears more uniformly lighted and free from streaks and shadows.

A view of the Concours at Waterloo Station, with "Cryselco" Opal Lamps mounted on girders.

DEVELOPMENTS IN MINERS' LAMPS.

Some time ago we referred to the new "C.E.A.G." Miners' Lamp,* operating on 4 volts, and enabling a lamp of considerably higher candle-power to be used. This improved light, it is believed, fully compensates for the greater weight of the battery, and we understand that the new lamp is being quite favourably received. The adoption of this higher voltage naturally suggests that gasfilled bulbs may eventually be used, and we were informed that experiments in this direction are proceeding. We were also shown an interesting development —at present in the experimental stage—which consists in the mounting of the bulb in an ingenious ball-and-socket arrangement, so that it can be turned in different directions over a wide angle. In these circumstances the lamp can be mounted in a short telescope and provided with a lens, so that a beam of considerable power is obtained. The miner can thus obtain quite a high illumination, and though the light is naturally concentrated within a smaller angle (instead of being emitted in all directions) it seems likely that this device will prove useful in practice. The development is in line with the general tendency in illuminating engineering; for it is only seldom that uniform distribution of light in all directions is desired, and in most cases we desire to concentrate most of the light over a relatively small working area.

Experiments have also been made with well glasses equipped with grooves and prisms (mainly on the inner side of the well glass so as to avoid deposit of grime), and some degree of concentration can be obtained in this way. It was interesting to learn that in certain collieries there is still a distinct preference for the yellow glass equipment, though the alleged benefits of light of this colour seem to require more investigation.

* *The Illuminating Engineer*, March, 1925, page 84.

THE "DIA" LONG-BURNING FLAME ARC.

In our last issue we gave some account of this novel form of flame arc lamp, developments in which will be watched with interest. Readers in London will shortly have an opportunity of seeing a number of these lamps in operation outside the Coliseum. Eight of the lamps are being distributed over the façade, so that the lighting effect should be brilliant.

Whilst referring to this lamp we take the opportunity of correcting an obvious slip in the description which appeared on page 254 in our September issue. The specific consumption was there given as "2·22-0·18" watts per H.K. (hemisph.). The correct figure is *0·22-0·18 watts per H.K.* Readers of *The Illuminating Engineer*, we imagine, are not likely to be misled by this slip, being well aware that a modern flame arc does not operate at over 2 watts per candle!

THE "HOLDRITE" SUSPENSION METHOD FOR ONE-PIECE GLASS LIGHTING UNITS.

Much effort has been expended on obtaining an entirely safe form of suspension for lighting glassware, and a new device, the "Holdrite" suspension, introduced by Messrs. Falk, Stadelmann & Co. Ltd. deserves attention. It consists of two semi-circular saddles sustaining the globe all round the lip, depending on a dual chain suspension, the cover or carrier merely resting on the glass. Amongst the advantages claimed for the method are (1) it will fit any shape of lip, (2) it allows for all variations in contour of lip and size of flange, (3) it surrounds the flange equally all round, without undue pressure anywhere, (4) it allows for free expansion of the glass under heat, (5) it obviates the damage consequent on screws working loose through vibration, (6) it renders the entire fitting practically dustproof, and (7) it affords full opportunity of cleaning the glass and renewing lamps without removing the globe from its hangings. A sketch in the leaflet before us shows the ease with which lamps can be removed, and an important feature is that no screws are required with the "Holdrite" suspension.

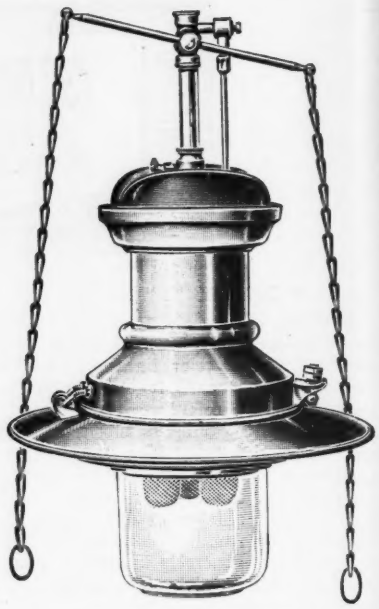
WELSBACH SPECIALITIES.

The current Welsbach catalogues contain particulars of a number of interesting developments and new forms of lamps. The familiar " Eddystone " burner will in future be fitted with an all-magnesia nozzle and mixing chamber combined, which is stated to be absolutely non-corrosive and to result in a material increase in candle-power. Another feature is the adoption of an all-brass gas adjuster with slotted arm, by which the regulator can be operated by the use of the edge of a coin—an innovation which should appeal to consumers. Another well-known type, the " Tuskar " cluster burner, is now made with a plain wing-shaped hood in polished aluminium, and is fitted with the all-metal adjuster mentioned above. There is also a new type of factory burner with cast iron superheater chamber for two or three bijou mantles, likewise equipped with the latest form of adjuster.

The illustration shows the " Calshott " indoor lamp, which is an attractive model specially suitable for shop-lighting, lobbies, etc. This has a polished aluminium casing, and is fitted with three-light superheater cluster burner. The Welsbach Light Co. Ltd. do not, however, confine themselves to gas-lighting appliances, as is shown by the view of the " Sunlight " centre-draught paraffin lamp. In spite of its moderate price, this lamp operates very efficiently, and can be used either with hangers or brackets.

As usual, the catalogue contains a good range of glassware and ornamental silk shades, accessories, etc. Special interest attaches to the " Silverstone " three-ply glassware, to which we have previously referred in these columns, and the wide range of painted glassware which is now proving very popular.

The " Sunlight " Paraffin Lamp.



The " Calshott " Lamp.

DEVELOPMENTS IN GAS LAMPS.

In the course of a recent visit to Messrs. A. E. Podmore & Co. we had the opportunity of examining some of the latest models of their lamps. What was even more interesting, however, was to find how long ago some of these modern methods were adopted by this firm. We understand that superheated angle-burners and cluster lamps were designed somewhere about 20 years ago, and we have before us a reprint of *The Gas Journal* commenting on some new two- and three-light outside lamps with angle-burners, with the hinged top to the lantern which enabled easy access to mantle and burners to be obtained. Another feature in these lamps was the provision of means by which one or more of several burners can be turned on at will.

In several modern lamps which we saw burning this device is still evident. Thus, in a five-light cluster lamp an easy motion enables either two, three or all five mantles to be used. This is an obvious convenience to the shopkeeper, who not infrequently needs a lamp at the back of his premises to supplement daylight, but does not wish to turn it full on. Similar circumstances occur on railways; we believe also that street lamps in Edinburgh and elsewhere are also operated on this principle. The effect is quite striking when applied to semi-indirect fittings with opal hemisphere. A unit of this type on view gives a very pleasing diffused light. A drawback which is sometimes urged against the use of diffusing glass is that one cannot see the exact state of mantles (consumers are apt to dismiss any diminution of light under the generic phrase " bad gas " !). But we cannot see that there is much force in this objection, and the easy removal of the glassware enables any defective mantle to be quickly detected and replaced.

In these and other fittings we were impressed by the solid and substantial construction. As this firm has made a speciality of export abroad (we were shown a picture of an imposing installation in Brazil, and we understood that many lamps have been sent to India and elsewhere), solid construction and requirements arising from climatic conditions and insect-proof qualities have long been considered.

PERSONAL.

We learn that Mr. H. N. Green, formerly associated with the Illuminating Engineering Department of Metro-Vick Supplies Ltd., has accepted an appointment under the Air Ministry, in connection with experimentation in the lighting of landing grounds and similar problems. His place has been taken by Mr. H. H. Long, already in the service of Metro-Vick Supplies Ltd., and formerly on the staff of Holophane Ltd.

STAGE LIGHTING AND SHOP-WINDOW LIGHTING.

The lighting of a shop window by concealed methods has much in common with lighting on the stage. The objects in both cases are substantially the same—to reveal the " setting," but conceal the lamps themselves. And when " display methods," that is the presentation of a charming picture, are adopted, the resemblance becomes closer still.

Hence it is not surprising to find that firms who specialize in stage-lighting devices, can readily apply their implements to shop lighting. In our last issue we gave an account of the many devices inspected during a visit to the Strand Electric and Engineering Co.'s works at Floral Street, Covent Garden. Of these quite a number find ready application in the shop window. Thus the trough units, equipped with a variety of gelatines in different hues, can be readily mounted along the top of a show-window; and spot-lights, equipped with movable colour-discs, are also useful, especially now that colour is beginning to play a big part in show-window displays. Such devices can be motor-driven, so that an ever-changing display of colour (such as a gradation of effect from sunset to moonlight) can be provided. As more elaborate effects are aimed at the opportunities of special devices for spectacular lighting become greater. In fact, an enterprising merchant desiring something really striking might do worse than call in the aid of a specialist in the craft of stage-lighting!

CONTRACTS CLOSED.

The following contracts are announced :—

BRITISH THOMSON-HOUSTON CO. LTD. :

Admiralty and *Office of Works;* for the supply of Mazda vacuum and gasfilled electric lamps.

GENERAL ELECTRIC CO. LTD. :

H.M. Office of Works; contract for nine months for the supply of high-voltage Osram vacuum lamps and high and low-voltage Osram gasfilled lamps.

METRO-VICK SUPPLIES LTD. :

Post Office, Stores Department; Cosmos gasfilled lamps and vacuum tungsten filament lamps for 12 months ending August 31st, 1926.

SIEMENS & ENGLISH ELECTRIC LAMP CO. LTD. :

Post Office; for the supply of Siemens vacuum and gasfilled lamps for the next 12 months.